# Compatibility of Bangladesh railway's locomotives spare parts current recoupment policy in present situation and assess efficiency and effectiveness of procurement function.

A dissertation in partial fulfillment of the requirements

for the Degree of

Masters in Procurement and Supply Management (MPSM)

Submitted to:

**Dr. Wahid Abdallah**
Research Fellow
BIGD, BRAC University

by

Engr. S.M. RASHED IBNEY AKBAR

MPSM, Fall-2015

Student ID No. **ID-15282013**

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BRAC Institute of Governance and Development (BIGD)

## BRAC University, Dhaka.

# DEDICATION

Dedicated to my father and mother whom constant inspiration and love enlighten me.

# DECLARATION

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Engr. S.M. RASHED IBNEY AKBAR

MPSM, Fall-2015

Student ID No. **ID-15282013**

BIGD, BRAC University, Dhaka.

# CERTIFICATION

This is my pleasure to certify that the dissertation entitled **" Compatibility of Bangladesh railway's locomotives spare parts current recoupment policy in present situation and assess efficiency and effectiveness of procurement function."** is an original work from Engr. S.M. Rashed Ibney Akbar and it is completed under my direct guidance and supervision. I also certify that I have gone through the dissertation and found it satisfactory for submission to the BRAC Institute of Governance and Development (BIGD), BRAC University in partial fulfilment of the requirements for the degree of Masters in Procurement and Supply Management.

Dr. Wahid Abdallah

Research Fellow

BIGD, BRAC University

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Engr. S.M. RASHED IBNEY AKBAR

MPSM, Fall-2015

Student **ID:15282013**

BIGD, BRAC University, Dhaka.

# EXECUTIVE SUMMERY

There is no denying to the fact that the safety and reliability of Railway transportation system largely depends on efficient maintenance of Rolling stock or whatsoever. Such goal needs a scientific and efficient maintenance management and maintenance management depends on efficient supply chain management.

Bangladesh Railway owns a big fleet of rolling stock, sophisticated and conventional and a vast organization is at work round the clock to look after them for optimum utility and efficient service for its users, for this reason proper maintenance is necessary.

The main objective of this study is to identify the Compatibility of Bangladesh railway's locomotives spare parts current recoupment policy in present situation and assess efficiency and effectiveness of procurement function. The investigation particularly included determining the existing performance of procurement. Mainly Data was collected from primary sources from depot ledger card which maintain each spare part.

While assessing the Compatibility of current recoupment policy of loco spare parts in terms of efficiency, effectiveness, screening out constraints and weakness and strategies to overcome the same.

BR is a state owned service provider. It provides safe, comfortable and economic transport services to the passengers and thus government is paying Public Service Obligatory grant. The losses and declining operational performance is closely related with efficient and effective Maintenance Management of locomotives which can accomplish by efficient and effective procurement.

Bangladesh Railway (BR), a principle transportation agency of the country, is a Government–owned and Government–managed organization. It operates and maintains the entire railway network of the country. The vision of BR is to provide safe, reliable, cost-effective, and time-efficient rail transport service in the country through modernizing, expanding, & maintaining rail system in a manner which supports government strategies for economic, social, & environmental development. To support the vision, BR has to procure goods to maintain & upgrade locomotives, coaches & other rolling stocks.

There are about 278 locomotives in the locomotive fleet of BR. To maintain these locomotives BR has four locomotive workshops: One central locomotive workshop at Parbatipur for over-hauling locomotives as heavy schedule maintenance and three diesel workshops at Dhaka, Chittagong and Parbatipur for medium schedule maintenance. To provide necessary materials and spares required for the daily maintenance works in the workshops, BR has a centralized procurement system under the Stores Department headed by the Chief Controller of Stores (CCS). The Stores Department is responsible for maintaining the whole supply chain of BR as it is solely responsible for the procurement of all goods (production materials as well as MRO supplies) required by the different user departments of BR. BR has to manage a inventory of more than 40,000 items, of which more than 27000 items are for locomotive spare-parts. A considerable percentage of the locomotives have passed its economic service life. Non availability of the spare-parts is a major issue in the locomotive maintenance works. That is why the procurement of locomotive spare-parts is crucial and challenging for the Stores Department of Bangladesh Railway. And this dissertation was focused only to the procurement of locomotive spare-parts, by the Chief Controller of Stores, Bangladesh Railway, required for the Pahartali Diesel Locomotive Workshop.

The specific objectives of the study were to identify current compatibility of procurement policy at present condition of diesel locomotive spare-parts and finally to suggest ways to improve the performance of procurement functions and enhance the consumers satisfaction.

The objectives of the study were achieved through three approaches; the first one was questionnaires that were obtained from respondents' of the procurement office (CCS office), the consumers (Diesel Workshops) and experienced officials of BR who have worked in the procurement of loco-spares and maintenance of locomotives. The second one was studying some spare parts recoupment history which is maintain in diesel depot.

Questionnaires were prepared to know the general perception and attitude regarding inventory management, to evaluate the strategic factors affecting the demand of spares, choice of procurement method and strategy, the impact of regulations on public procurement (The Public Procurement Rules, 2008), category management and to evaluate the use of

information and Communication Technology at central procurement office and to determine the level of satisfaction in terms of spars availability and so on.

After getting the response from the respondents' from questionnaires, practical experience and key informant interview, they are analysed in light of the objectives of the study and then the study recommends some of the key areas for improvement of procurement management. The researcher recommends a number of possible ways for improving areas to procurement management like organization and management, portfolio segmentation, sourcing, introducing sustainable tender and contract terms supplier base optimisation, relationships development and management with key suppliers, personnel management, introduction of ICT, contract management and Business Process Reengineering (BPR). The researcher believes that if BR considers and implements those recommendations in procurement management, certainly, the delivery performance will be improved considerably, and thereby, consumers' satisfaction will also be increased.

## Table of Contents:

## ABBREVIATIONS AND ACRONYMS

| | | |
|---|---|---|
| ACOS | : | Assistant Controller of Stores |
| ADG | : | Additional Director General |
| AMC | : | Average Monthly Consumption |
| APP | : | Annual Procurement Plan |
| BCP | : | Business Continuity Plan |
| BDT | : | Bangladesh Taka |
| BG | : | Broad Gauge |
| BIGD | : | BRAC Institute of Governance and Development |
| BOM | : | Bills of Materials |
| BPR | : | Business Process Reengineering |
| BR | : | Bangladesh Railway |
| BRA | : | Bangladesh Railway Authority |
| BRASS | : | Bangladesh Railway Automated Support System |
| C&W | : | Carriage And Wagon |
| CCS | : | Chief Controller of Stores |
| CFR | : | Cost and Freight (Incoterm 2010) |
| CIPS | : | The Chartered Institute of Procurement and Supply |
| CLW | : | Central Locomotive Workshop |
| CME | : | Chief Mechanical Engineer |
| CPTU | : | Central Procurement Technical Institute |
| CTG | : | Chittagong |
| DCOS | : | District Controller of Stores |
| DD | : | Deputy Director |
| DG | : | Director General |
| DIR | : | Director |
| DL | : | Diesel Locomotive |
| DLW | : | Diesel Locomotive Workshop |
| DPM | : | Direct Procurement Method |
| DRP | : | Disaster Recovery Plan |
| EOQ | : | Economic Order Quantity |
| ERP | : | Enterprise Resource planning |
| F&C | : | Fraud and Corruption |
| FC | : | Foreign Currency |
| FY | : | Fiscal Year |
| GOH | : | General Overhauling |
| HOPE | : | Head of Procuring Entity |
| HRM | : | Human Resources Management |
| ICC | : | Inventory Control Cell |

| | | |
|---|---|---|
| ICT | : | Information and Communication Technology |
| IFT | : | Invitation for Tender |
| ISO | : | Organisation for International Standard |
| JIT | : | Just in Time |
| KPI | : | Key Performance Indicator |
| L/C | : | Letter of Credit |
| L/D | : | Liquidated damage |
| LT | : | Lead Time |
| LTM | : | Limited Tendering Method |
| MDM | : | Manuscript Memorandum of Differences |
| MG | : | Meter Gauge |
| MIS | : | Management Information System |
| MOQ | : | Minimum Order Quantity |
| MPS | : | Master Production Schedule |
| MPSM | : | Masters in Procurement and Supply Management |
| MRO | : | Maintenance, Repair and Operation |
| MRP | : | Material Requirement Planning |
| MRP-II | : | Manufacturing Resource Planning-II |
| NL | : | Numerical ledger |
| NOA | : | Notification of Award |
| NymEX | : | New York Mineral Exchange |
| OECD | : | Organization for Economic Co-operation and Development |
| OEM | : | Original Equipment Manufacturer |
| OTIF | : | On Time in Full |
| PE | : | Procuring Entity |
| PHT | : | Pahartali |
| PI | : | Purchase Indent |
| PO | : | Purchase Order |
| PP&C | : | Production Planning & Control |
| PP&C | : | Progress, Planning and Coordination |
| PPR | : | The Public Procurement Rules, 2008 |
| PSI | : | Pre-shipment Inspection |
| PXC | : | Paksey |
| R&R | : | Repair and Return |
| R. Note | : | Receipt Note |
| RITES | : | Rail India technical and Economic Service |
| RNB | : | Railway Nirapatta Bahini |
| RS | : | Rolling Stock |
| SR | : | Stock Recoupment |
| TCO | : | Total Cost of Ownership |

| | | |
|---|---|---|
| TEC | : | Tender Evaluation Committee |
| TER | : | Tender evaluation Report |
| TNA | : | Training Need Analysis |
| TOC | : | Tender opening Committee |
| TQM | : | Total Quality Management |
| VMI | : | Vendor Managed Inventory |
| WB | : | World Bank |
| WIP | : | Work in Progress |
| WLC | : | Whole Life Costing |
| WM | : | Works Manager |

## 1.1 An overview of Bangladesh Railway

### 1.1.1 Bangladesh Railway in short

Bangladesh Railway, a principle transportation agency of the country, is a Government owned and Government managed organization. It covers a length of 2877.10 route kilometers employing a total of 29039 (June 2016) regular employees. As railway is a very important mode of inland transport, linking the entire length and breadth of the country, its healthy grow naturally contributes to the economic development of the country.

Till June 2, 1982, the management and development of railway was vested with a Railway Board, comprising of a Chairman and four members. But, for administrative convenience and operational reason the Railway Board was abolished with effect from June 3, 1982 and the function of the Railway Board was vested with the Railway Division of the Ministry of Communications with the Secretary of the Division working as the Director General of Bangladesh Railway. For the same purpose the Railway bifurcated into two zones, East & West, under the administrative control of two general managers, who are accountable to the Director General of Bangladesh Railway. Subsequently on August 12, 1995 the day to day operation of the Railway was separated from the Ministry and entrusted with director general drawn from the Railway professionals. For policy guidance, a 9(nine) member Bangladesh Railway authority (BRA) was formed with the Minster Ministry of Communications as its Chairman. In December 2011 Ministry of Railways formed by the Honorable Prime Minister under SRO-361 Rules of Business 1996 Rule-3. The Director General is assisted by Additional Director General and Joint Director General to perform all administrative and policy making jobs.

The General Managers of the two zones are assisted by various specialized departments who are responsible for operation, maintenance and financial management. Each zone is again divided in two divisions, which are the basic unit of operation. The division is headed by a Divisional Railway Manager, who is assisted by Divisional Officers of various specialized Departments such as Personnel, Transportation, Commercial, Finance Mechanical, Way and Works Signaling & Telecommunication, Electrical, Medical, Nirapatta Bahini etc. Besides there are two workshop Divisions, one in each zone, located at Pahartali and Saidpur, each being headed by a Divisional Superintendent. Further there

is a locomotive workshop headed by Chief Executive at Parbatipur for general overhauling of both BG & MG locomotives.

Bangladesh Railway also has Railway Training Academy headed by a Rector, a planning cell headed by a Chief Planning Officer, stores Department headed by a Chief Controller of Stores and Accounts Department headed by an Additional Director General/Finance for coordinating and advising accounting and financial management activities of the two zones. To ensure safety of Railway transportation, Government has set up a separate Directorate under Ministry of Railways to inspect different works of BR relates with the train operation.

### 1.1.2 Vision

To provide safe, reliable, cost effective and time efficient rail transport service in the country through modernizing, expanding & maintaining rail system in a manner which supports government strategies for economic, social & environmental development.

### 1.1.3 Mission

- Develop & maintain railway tracks & station infrastructures throughout the country.
- Maintain & upgrade locomotives, coaches & other rolling stocks.
- Maintain & modernize signaling & interlocking system & Telecom system of Bangladesh Railway.
- Ensure safe, speedy & efficient train operation.
- Implement Government transport policy in rail sector.
- Procure modern technology related rolling stocks, Track materials & signaling systems suitable for Bangladesh Railway.
- Manage land asset of Bangladesh Railway.
- Ensure optimum utilization of Development Budget & Revenue Budget of Bangladesh Railway.

# CHAPTER 1
# INTRODUCTION

## 1.1 Background:

The history of transportation is very old. But the history of railways is not so old. The railways are a younger member of the transport family. On land, the sledge, the litter, the cart, the chariot, the tramway, borne by man or drawn by animal and on water, the raft, the canoe and the boat moved by wood and wind, all these are much older means of transport. The modern railway was a development of the horse-drawn wagon or tramway, used in England in sixteenth to eighteenth centuries for haulage of minerals to rivers or ports. As the roads were bad and wagons had to be guided through tunnels, someone thought of laying down wooden planks for the wheels to run on. The planks wore out quickly and then someone else put iron plates to nail them down to reduce wear. The wooden plants and wheels were replaced with iron. The history of railway is closely linked with the growth of civilization of mankind and Maintenance Management plays a key role from the beginning of the Railway transportation. Till its commencement in 1862, different workshops, loco sheds, Carriage and Wagon repair Depots were established for repairing and maintenance of rolling stock and other equipments. More than century old is the Maintenance Management practice in Bangladesh Railway. Bangladesh Railway (BR), a principle transportation agency of the country, is a Government–owned and Government–managed organization. As railway is a very important mode of inland transport, linking the entire length and breadth of the country, its healthy grow naturally contributes to the economic development of the country.

It operates and maintains the entire railway network of the country. BR is controlled by the Directorate General (DG) of Bangladesh Railway under the Ministry of Railways along with Bangladesh Railway Authority (BRA) and which works for policy guidance of BR. BR is comprised of various specialized departments such as Engineering, Mechanical, Electrical, Signalling & Telecommunication, Transportation, Commercial, Stores, Personnel, Finance, Planning, Medical, RNB, Estate department, etc.

BR operates international, inter-city, and suburban rail systems on its multi-gauge network. BR has own workshops under mechanical department for repair and maintenance works of rolling stocks (locomotives, carriage and wagons). It also owns coach production facilities. The vision of BR is to provide safe, reliable, cost-effective, and time-efficient rail transport service in the country through modernizing, expanding & maintaining rail system in a manner which supports government strategies for economic, social & environmental development. To support the vision, there are several missions of BR and following two are related to procurement of goods:

- Maintain & upgrade locomotives, coaches & other rolling stocks.
- Maintain and procure modern technology related rolling stocks, Track materials & signalling systems suitable for Bangladesh Railway.
- Develop & maintain railway tracks & station infrastructures throughout the country.

There are about 278 locomotives out of which 262 Diesel Electric (96 BG & 166 MG) and 16 Diesel Hydraulic (3 BG & 13 MG) locomotives in the locomotive fleet of BR (*BR*[1]*, 2014*). To maintain the locomotives, BR has four locomotive workshops:

- Central Locomotive Workshop (CLW), Parbatipur, Dinajpur
- Diesel locomotive Workshop (DLW), Pahartali, Chittagong and
- Diesel locomotive Workshop (DLW), Dhaka
- Diesel locomotive Workshop (DLW), Parbatipur, Dinajpur

To provide necessary materials and spares required for the daily maintenance works in the workshops, BR has a centralized procurement system under the Stores Department headed by the Chief Controller of Stores at Pahartali, Chittagong. The Stores Department is responsible for maintaining the whole supply chain of BR as it is solely responsible for the procurement of all goods (production materials as well as MRO supplies) required by the different user departments of Bangladesh Railway. BR has to manage a huge inventory of more than 40,000 items of which more than 27,000 items are of locomotive spare-parts. That is why the procurement of locomotive spare-parts is crucial and challenging for the Stores Department of Bangladesh Railway.

## 1.2 PROBLEM STATEMENT

The locomotives of Bangladesh Railway are very old. A major portion of the locomotives have passed their normal economic life-span. Locomotives and their spare-parts are manufactured by a few numbers of loco-builders and OEMs in the world. These goods are specified and determined by the manufacturer's part numbers. So, loco-spares are treated as goods of specialised nature.

[1] Bangladesh Railway Information Book, 2014

The spare-parts are categorised as 'critical' to the production of workshops, as these are not available in the local/ home market. These are needed to be imported from abroad requiring considerably higher lead time and consequently a huge amount of inventory of spare-parts have to be held in the warehouse, at the expense of huge inventory costs. For the efficient and effective management of such a huge inventory, effective use of inventory management software, such as MRP or ERP, is essential to optimise inventory level. But BR is not using MRP or ERP at present. And that is why providing spare-parts, cost effectively, at the time of workshops need is a problem.

This study investigated into the current practice of procurement used by the Stores Department of BR , analysed the cause of failure to supply in time finally suggested an applicable way to improve procurement performance as well as to enhance consumer satisfaction considering current situation.

## 1.3 RESEARCH QUESTIONS

Understanding the problem of management in the loco-spare parts procurement, the research questions were:

- Is suitable the current practice used by the Stores Department of BR (Purchase department) to purchase locomotive spare-parts for fulfill the needs of the consumers (workshops) in terms of availability?
- What are the main causes for failure to supply loco-spares parts in time?
- What is the solution to overcome this failure?

## 1.4 RESEARCH OBJECTIVES

The purpose of the study was to examine the current procurement practice used by Stores Department of BR for the procurement of locomotive spare-parts and assess how much it would meet the needs of the workshops in terms of timely delivery. The specific objectives were:

- To explore current procurement system used by BR for the procurement of locomotive spare-parts.
- To analyse the adherence to the procurement regulations

- To identify the challenges in the current procurement system
- To determine the level of satisfaction of the consuming department in terms availability of spare-parts.
- To recommend ways for improvement in the procurement system

## 1.5 RATIONALE OF THE STUDY

Maintenance Management is crucial for sustaining long life, safety performance of a machine, plant and rolling stock. In Bangladesh Railway, locomotives maintenance starts at the day of historical start of Railway on 15$^{th}$ November 1862, during British period. In the meantime since 1972, the Railway Organization Management Structure has been reorganized four times. But during the time, maintenance technology has undergone vast improvement and challenges in the twenty first century, a period characterized by innovations brought about by the information age and the globalization era. Bangladesh railway is depended its locomotives maintenance by spare parts procurement in just in time. This study in fact, highlights to ensure the spare parts supply just in time in current situation.

## 1.6 SCOPE AND LIMITATION OF THE STUDY

The study would have core intention to examine the existing procedures followed for the procurement of loco-spares by the stores department of BR by the CCS. This study focused on the Material Requirement Plan, Procurement Plan, Tendering system, and Procurement Methods used in the procurement of spare-parts required, only, for the Pahartali Diesel Workshop. This study went further to investigate and analyse the whole procurement cycle and to identify average lead time (the time elapsed between the demand generation and demand fulfilment) of the procurement of spare-parts for Pahartali Diesel Locomotive Workshop.

Any successful procurement depends on many factors. The study was considered only few major factors that affect procurement. Again Bangladesh railway has some locomotives spare parts user but this study only consider one user. Therefore, the study has a narrow focused area covering only one consumer of locomotives spare-parts.

## 1.7 STRUCTURE OF THE REPORT

The report is comprised of five chapters. The first chapter contains an **Introduction**-covering background, scope, rationale, research questions, and objectives, limitation of the study and structure of the thesis. Chapter Two consists of a **Literature Review**-covering the discussion on the existing literatures and conceptual frame work of this research. Chapter three contains **Research Methodology**- contains an explanation on the data collection methods and justification for using the methods. This chapter also contains analytical frame work of the study. Chapter four holds **Data Analysis and Result Discussion**-covers analysing the data, interpreting the results and findings. Chapter five is the final chapter: **Conclusion and Recommendation**-contains a decisive conclusion and recommendation for the improvement of the current procurement system.

CHAPTER-2

# LITERATURE REVIEW

## 2.1 Objectives of Maintenance Management of rolling stock

A sound and modern knowledgeable Maintenance Management is one of the primary requirements of superior performance, safety and comfortable Railway communication. The function of Maintenance work is to increase the profitability of plant that can be achieved by using Maintenance work to raise the level of equipment performance and increasing availability of Rolling Stock. However, the maintenance work also has to be paid for and so an increased level of maintenance work adds to the running costs of the company, reducing profitability. The graphs shown in the figure 2.2 below illustrates the effects of Maintenance costs on total production costs.

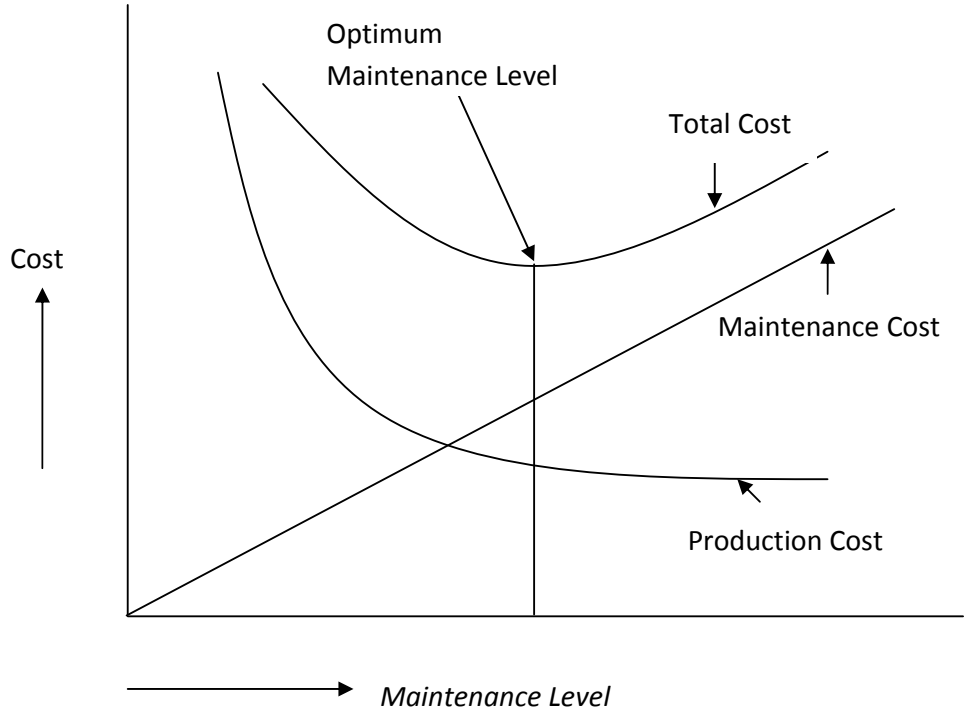



Figure1: Effect of Maintenance costs on total production costs

The situation is that for a very low maintenance activity very high production costs are incurred due to frequent interruptions of production because of equipments failure. The main objective of Maintenance Management is to maintain an optimum level of maintenance with superior quality without compromising in the matters of safety. The objectives of maintenance department meet the objectives of Railway- (a) Increase in Revenue, (b) Reduction of direct cost, (c) Increase in productivity is to be retained on a "No loss, No Profit" basis.

**Table1: Locomotives maintenance inspection Cycle**

| ***Type of Inspection*** | ***Cycle/ Inspection*** | ***Time Taken*** | ***Place*** | ***Remarks*** |
|---|---|---|---|---|
| *C* | *45 day* | *6-8 hrs* | *Loco Shed* | *Light Schedule* |
| *D* | *90 day* | *8 hrs* | *Do* | *Do* |
| *E* | *180 day* | *16 hrs* | *Do* | *Do* |
| *F* | *1 year – 6 month* | *10 days* | *Workshop* | *Heavy Schedule* |
| *G* | *3 years* | *21 days* | *Do* | *Do* |
| *GOH* | *6 years* | *45 days* | *CLW* | |

## 2.2 Purchasing, Supply and Procurement

### 2.2.1 Defining Purchasing, Supply and Procurement

**Purchasing** can be defined in various ways, depending on perspective. The purchasing function of an organisation involves the acquisition of supplies or inputs (raw materials, components, goods and services) to the organisation's activity. In some organisations, there is a purchasing department which has responsibility for carrying out this function, while in others, it may be carried out by individuals or teams in other department (such as production or finance), or as part of the larger more integrated cross-functional structure such as materials management, logistics management or supply chain management.

The basic objective or purpose of purchasing is 'to buy materials of the right quality, in the right quantity, delivered to the right place at the right time at the right price'

**Procurement** is a wider term than purchasing, which implies the acquisition of goods or services in return for a monetary or equivalent payment. Lysons & Farrington[2] argue that traditional definitions of purchasing are inadequate and outdated. Procurement may be defined as 'the process of obtaining goods or services in any way, including purchasing, hiring, leasing and borrowing'. Procurement is therefore a more accurate term for what organisation's procurement function actually does. It reflects the more proactive, relational, and strategic and integrated role of the function in modern organisation.

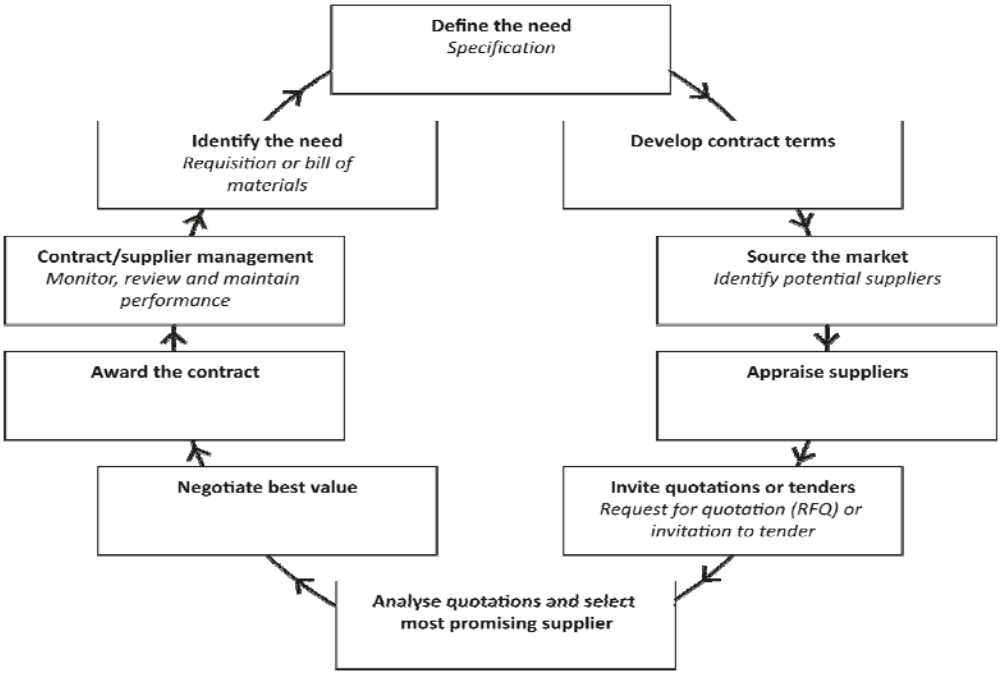
**Supply** may be defined simply as the act (or process) providing something or making something available, often in response to buyers' or customers' requirement. In practice, supply often happens in a longer chain of activity by which outputs of one supplier become inputs of its customer, and so on.

### 2.2.2 Generic Procurement Cycle

[2] Purchasing & Supply Chain Management (Seventh Edition)-Lysons and Farrington

The generic procurement process may have several stages: from identifying the needs, defining the needs, developing contract terms, source the market, appraise suppliers, invite quotations, negotiate best value, award the contract, contract/ supplier management (CIPS, 2012[3]).

**Figure 2: Generic procurement cycle**




For the purpose of this dissertation, **the author defines procurement as** 'the strategic process of set stages, or a chain of events, undertaken by the procurement function (e.g. stores department in Bangladesh Railway) as part of the integrated supply chain, to make a purchase or acquisition, sourcing and negotiating with suppliers, placing an order, receiving the ordered supplies, and making payment under a regulatory framework on contractual means, and managing all issues arising thereby.

[3] Context of Procurement and Supply (CIPS, 2012)

### Role of Procurement

Role of procurement may vary widely according to departmental organisation, specific role descriptions, and organisation type, but in general, the task of procurement at an operational level includes the following activities:

- Supply market monitoring, and identifying potential sources of supply
- Supplier evaluation and selection
- Processing procurement or stock replenishment requests (requisitions)
- Providing input to the preparation of specifications for new purchases
- Negotiating, buying and developing contracts setting terms and conditions of trade between buyer and seller.
- Expediting or contract management ensuring that suppliers deliver according to the purchase order or contract
- Clerical and administrative tasks: record keeping, report generation and processing of documentation through all of the above activities.

## 2.3 Significance of Procurement

### 2.3.1 Changes in the cost base of business

In recent decades, the cost structures of manufacturing have been transformed. Previously, the largest expense was the cost of wages, due to labour intense manufacturing. Today the situation is different. Many industries have seen a huge investment in automated production process, and in many cases this has been accompanied by painful cuts in work forces.

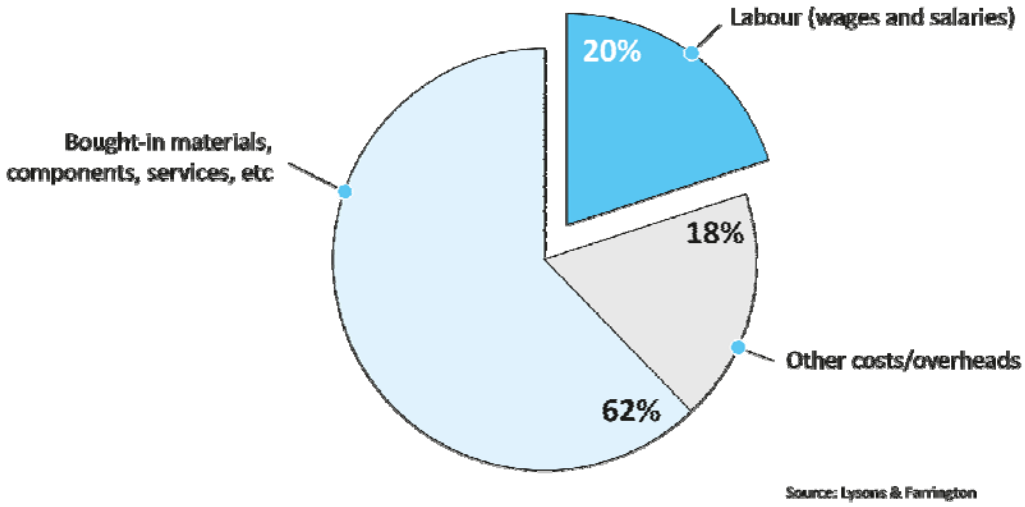
Manufacturing businesses have similarly increasingly ready to specialise in just one part of the manufacturing process. Where previously they might have 'made' product entirely from scratch, nowadays they are more like to 'buy' sub-assemblies or modules for that product from external suppliers and confine them to the assembly process.

One effect of these trends is to shift the balance of organisational costs away from internal labour costs-and towards external expenditure with suppliers and sub-contractors. Organisations spend a much greater proportion of their budgets on buying in goods, services and works than they used to do.

### 2.3.2 Typical Breakdown of costs

The situation will vary, according to the size and type of organisation and kinds of object of procurement. A typical view of the proportion of organisational costs represented by external procurements for a modern manufacturing company may be as follows:

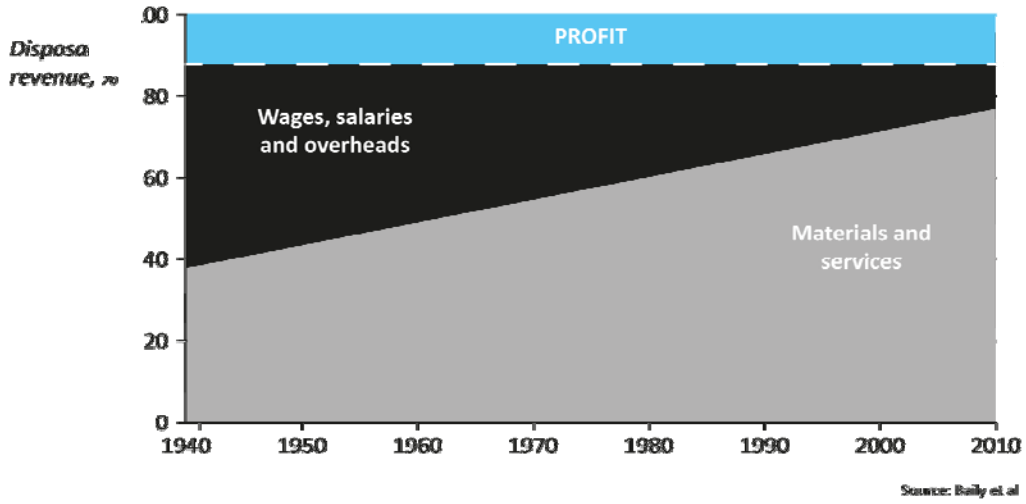
**Figure 3: Organisational costs represented by procurement spend[4]**




The trend towards the growth of external spend in relation to internal costs such as wages and overheads in a manufacturing setting can be depicted as follows:

**Figure 4: The proportion of external to internal costs**

[4] Purchasing and Supply Chain Management (Lysons & Farrington)




One of the key implications of these trends for procurement is that, as the proportion of external expenditure rises, the potential impact of effective procurement activity on the costs, financial health and profitability of the organisation is correspondingly greater.

## 2.4 Categories of Procurement

As procurement disciplines have been developed more and more widely, the procurement objects are divided into: Direct and In-direct Procurement, Commodity Procurement, Stock, and Non-stock Procurement, Capital Procurement, Consumables, and MRO supplies, in more general current terminology.

### 2.4.1 Direct and Indirect Procurement

**Direct Procurement** refers to a range of situations when the items procured are either for resale or for incorporation in final product. In manufacturing setting, such as in locomotive repair workshop, these are often classified under the headings: raw-materials, components, assemblies and sub-assemblies, work-in-progress.

**Indirect** Procurement refers to the purchase of any other, ancillary items, including MRO supplies, services and other operating associated objects.

**Significance of the difference**

A number of practical implications arise from the distinction between direct and indirect procurement:

- The quality of the direct procurements has the direct impact on the quality of the final products. By contrast quality of indirect the indirect procurement does not generally impact on the production quality.

- Direct procurements frequently need to be held in stock, in order to maintain production and service level. By contrast indirect procurements are usually made as and when required, minimising the inventory costs.

- Direct procurements are more likely to be made via longer-term, more collaborative supplier relationships, since the priority will be the security and continuity of supply. By contrast, indirect procurements are frequently made on the basis of one-off, transactional relationships, in order to take the advantage of price competition, since the priority will be cost efficiency.

- Direct procurements are more likely to be carried out by the procurement and supply chain department, because of their specialised nature, the need for complex contract and supplier management, and the potential impact of supply disruptions or quality problems on production operations. By contrast, indirect procurements are more likely to be carried out by the using departments, as they represent 're-buys' of standard supplies, often supported by 'approved suppliers lists' or 'framework agreements for supply' or 'blanket ordering' made by the supply chain department, against which orders can be 'called off' as required.

### 2.4.2 Stock and Non-stock Procurement

Most organisations need to hold certain level of stock of items to meet customer needs and production requirements. Purchasing department procure Stock Items on the basis of formal or informal estimates of demand, based on historic usage rates, and forecasted demand and so on. There are costs associated with holding stocks: cost of capital tied up in stock, cost of space

and insurance, cost of stock wastage due to deterioration or obsolescence, and so on. Modern thinking 'lean thinking' emphasizes the need to minimise stock levels.

**Non Stock** procurement (Stock to order) policy refers the situations where purchasing department only procures materials as required to fulfil orders received from users and customers.

### 2.4.3 Capital Procurement

Capital procurements are, non-recurring, procurement of those items which have high acquisition costs and long life cycles, usually several years. Typical examples of capital procurements include: procurement of locomotives, plant, and machineries, construction of new railway tracks and so on. This requires different set of considerations because the initial purchase price is only one element, and sometimes not the most important element, in the 'total cost of ownership (**TCO**)' of the asset. The 'whole life costing (**WLC**)' of capital goods includes: cost of procurement, installation costs, operation costs, maintenance costs, downtime costs and disposal costs. Alternative options for capital procurements are: buy, lease, or hire.

## 2.5 Segmenting External Procurement

### 2.5.1 Procurement Portfolio Segmentation

Segmentation is an approach to analysing expenditure with external suppliers by categorising the procurement portfolio or suppliers according to their priority, value, or importance to the organisation. The segment to which a procurement or supplier is allocated determines the procurement resources and approaches that will be used in each case. Procurement literatures suggest using the following tools for such segmentation: Pareto Analysis, Procurement Positioning Matrix etc.

### 2.5.2 Pareto (or ABC) Analysis

Italian economist Vilfredo Pareto formulated the proposition that 'in any series of elements to be controlled, a selected small factor in terms of number of elements (20%) almost always accounts for a large factor in terms of effort (80%)'.

In a procurement context, the Pareto principle can be interpreted as 80% of spends being directed towards just 20% of the suppliers. This elementary segmentation can be used to separate the critical few suppliers (who supply important, high-value, high-usage items, and limited source) from trivial many (who supply routine, low-value supplies). Most procurement effort and energy needs to be focused on the critical few suppliers and items procured from them. This segmentation can be summarised[5] by categorising procurement or inventory in to following three categories:

**Category-A items:** Because of the high value, stock must be minimised, but due to high usage continuity of supply is important. Preferred option for procurement is 'Just in Time' (JIT), with known requirements and low buffer stock. Most procurement and managerial controls need to apply here.

**Category-B items:** Regular stock review and replenishment will be required, with ordering against demand forecast, and some buffer stock held to maintain continuity of supply. A moderate level of controls needs to exercise in this area.

**Category-C items:** High in number, but with low usage value suggests minimum procurement and managerial effort. Organisation may use automatic replenishment methods, such as 'two-bin' system or 'Vendor Managed inventory" (VMI), where responsibility for managing stock is delegated to the supplier. Larger levels of safety stock are typically held, to minimise transaction costs.

### 2.5.3 Procurement Positioning Matrix

The Pareto or ABC approach to segmentation is based on the value and volume of business the organisations do with the suppliers. However, this is not only factor that a procurement or supply chain department should consider when segmenting suppliers.

The procurement managers should consider the following two factors:

[5]Supply Chain in 90 Minutes (Emmett)

- **The importance of the items to the organisation:** related to factors such as Value of the annual procurement, its profit potential or cost reductions

- **The complexity of the supply market:** related to factors such as difficulty of sourcing, vulnerability of supply or supplier failure, relative position of purchaser to the supplier or to supply market.

Procurement Positioning Matrix[6] is a tool which can be used to map the above two factors to segment procurement portfolio as shown below:

**Figure 5: The Kraljic Procurement Portfolio Matrix**

| *Importance of the item* | *Complexity of the supply market* | | | |
|---|---|---|---|---|
| | **Low** | | **High** | |
| **High** | **Procurement focus**<br>Leverage items | **Time horizon**<br>Varied, typically 12-24 months | **Procurement focus**<br>Strategic items | **Time horizon**<br>Up to 10 years; governed by long-term strategic impact (risk and contract mix) |
| | **Key performance criteria**<br>Cost/price and materials flow management | **Items purchased**<br>Mix of commodities and specified materials | **Key performance criteria**<br>Long-term availability | **Items purchased**<br>Scarce and/or high-value materials |
| | **Typical sources**<br>Multiple suppliers, chiefly local | **Supply**<br>Abundant | **Typical sources**<br>Established global suppliers | **Supply**<br>Natural scarcity |
| | **Procurement focus**<br>Non-critical items | **Time horizon**<br>Limited: normally 12 months or less | **Procurement focus**<br>Bottleneck items | **Time horizon**<br>Variable, depending on availability vs short-term flexibility trade-offs |
| | **Key performance criteria**<br>Functional efficiency | **Items purchased**<br>Commodities, some specified materials | **Key performance criteria**<br>Cost management and reliable short-term sourcing | **Items purchased**<br>Mainly specified materials |
| | **Typical sources**<br>Established local suppliers | **Supply**<br>Abundant | **Typical sources**<br>Global, predominantly new suppliers with new technology | **Supply**<br>Production-based scarcity |
| **Low** | | | | |

[6] Purchasing must become Supply Management (Peter Kraljic, 1983)

**For routine items:** (Low importance-low complexity: such as locally available non-critical spare parts having multiple source); procurement focus will be on procurement costs. Arm's length approached such as VMI, blanket ordering, framework agreements and call-off orders and e-procurement solutions, purchasing cards, will provide routine efficiency. Procurement management is achieved by monitoring expenditure against regular reports received from vendors, end-user, or e-procurement.

**For bottleneck items:** (Low importance-high complexity: such as propriety spare parts or specialised spare parts having limited source, which could cause operational delays, if unavailable); procurement focus will be on continuity and security of supply. This may be achieved through approaches such as medium to long-term contracts with selected suppliers; developing alternative or back-up sources of supply; including incentives and penalties in contracts to ensure the reliability of delivery; or keeping higher levels of buffer or safety stock.

**For leverage items:** (High importance-low complexity: such as propriety spare parts or specialised spare parts having abundant source); procurement focus will be on using purchasing power in the market to secure best price and terms, on purely transactional basis. This may mean taking advantages of competitive pricing through: Standardising specifications to make supplier switching easier; using competitive bidding; forming procurement consortia to secure best deals.

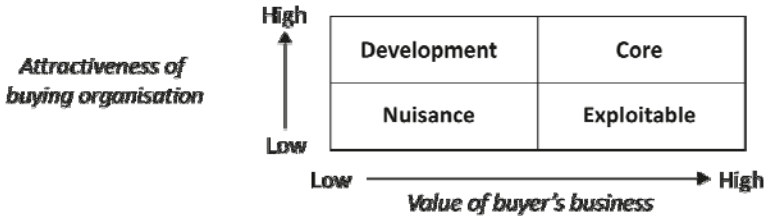
**For strategic/critical items:** (High importance-high complexity: such as major components of locomotives); procurement focus will be on total costs, security and competitiveness of supply. This may be achieved through approaches such as developing long-term, mutually beneficial strategic relationship and relationships management disciplines.

### 2.5.4 Supplier Preference

Procurement positioning models described above illustrate the buyers' perspective. For developing long-term collaborative relations with suppliers, it is desirable to examine how attractive the buying organisation in the eye of the selected suppliers. The Supplier

Preferencing Model[7] is a tool for analysing how attractive it is to supplier to deal with a buyer, and the monetary value of the buyer's business to the supplier.

**Figure 6: Supplier Preferencing Model**




**Nuisance** customers are neither attractive nor valuable to do business with. For example, BR might be seen as a nuisance customer by GE Transportation, USA.

**Exploitable** customers offer large volume of business, which compensates for lack of attractiveness.

**Development** customers are attractive, despite of presently low levels of business, if potential to grow account is seen.

**Core** customers are highly desirable and valuable for suppliers, who will want to establish long-term, mutually profitable relationships, if possible.

## 2.6 Procurement Plan

To ensure availability of right quantity of materials at the right time strategic procurement planning is indispensable. Procurement regulations also emphasizes on the procurement plan at the beginning of each fiscal year (PPR, 2008)[8]. To make effect procurement plan, the purchasing managers need to consider the following factors:

- Production schedule or plan for manufacturing organisation
- Actual or estimated demand of materials
- Procurement portfolio segmentation and supplier preferencing
- Supplier segmentation
- Nature of the goods to be procured

[7] Managing Contracts and Relationships in Procurement and Supply ( CIPS, 2012)
[8] The Public Procurement Regulations, 2008 (CPTU, GoB)

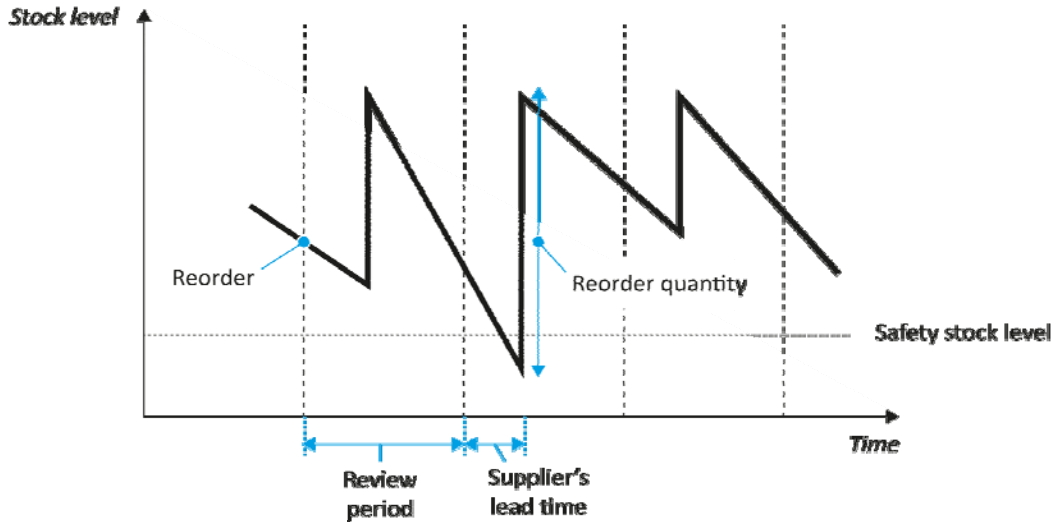
- Market structure
- Supply side factors such as minimum order quantity (MOQ)
- Factors determining economic order quantity (EOQ)
- Lead time for procurement and supply
- Need by date, and so on.
- Inventory policy of the organisation (Push or Pull System)

### 2.6.1 Push Inventory Systems

Push inventory system, for independent demand; aim to set up a regular system for monitoring levels of stock, and planning to replenish them in time to meet forecast demand. There are two main methods for replenishment: Periodic review system and fixed order quantity system (or Re-order Point system)

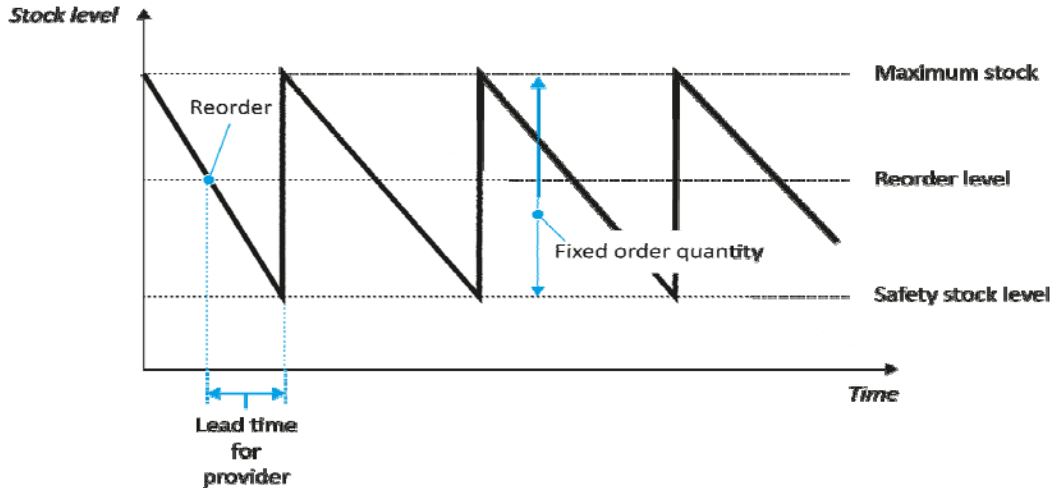
In **periodic review system**, the stock level of an item is reviewed at regular or fixed intervals, and depending on the quantity in stock a replenishment order is placed for whatever quantity appears to be appropriate to top up stock to the desired level. The review period will be determined depending on the category of the item.

**Figure 7: Periodic Review System**



In a **fixed order quantity system**, stock item is replenished with a predetermined maximum quantity when inventory falls to a predetermined reorder level.

**Figure 8: Fixed Order Quantity System**




### 2.6.2 Pull Inventory Systems

Pull inventory management systems for dependent demand items, are based on producing goods in response to actual demand, such as actual production programme. In such system demand is much more certain: it can be planned to have low inventory, as in JIT.

Following are the world class practices for pull inventory management systems:

(i) **Just in Time (JIT):** JIT is a radical Japanese approach to inventory reduction which aims to ensure that goods only arrive at the factory 'just in time' to go into the production.

(ii) **Materials Requirement Planning (MRP)**: MRP is a set of logically related procedures, decision rules, and records for managing dependent demand items. It is designed to translate a 'Master Production Schedule' (MPS) and 'Bills of Materials' (BOM) into 'time phased net requirements', taking into account existing stock, which trigger purchasing.

(iii) **Manufacturing Resource Planning (MRP-II):** MRP-II is same as MRP plus personnel deployment, maintenance planning and financial analysis for accurate costing of manufacturing.

(iv) **Enterprise Resource Planning (ERP):** ERP consolidates materials, manufacturing, logistics, supply chain, sales/ marketing, finance, and HR planning information into one integrated management system: a single database able to offer 'real time' information for solving range of business problems. It can handle both push and pull inventory system. It can be implemented through internet, intranet or extranet.

**Advantages of ERP:**

(i) Faster inventory turnover may reduce inventory costs
(ii) Improve customer service
(iii) Better inventory accuracy
(iv) Improved information management
(v) Reduced inventory audit
(vi) Eliminate duplication of effort and re-work
(vii) Improved cash flow management

**Disadvantages of ERP:**

(i) ERP implementation is very difficult, because it involves fundamental change from functional to process approach to business.
(ii) ERP systems are very expensive; this is especially so when customisation of standard modules to accommodate different business processes is involved
(iii) It has been estimated that some 50% of ERP implementation fail to deliver the anticipated benefits.
(iv) Cost of training employees to use ERP is high

There may be a number of unintended consequences such as employee stress and a resistance to change and sharing information that was closely guarded by departments or functions

## 2.7 Supplier Appraisal and Pre-qualifications

The purpose of supplier appraisal, evaluation, or pre-qualification is to ensure that a potential supplier will be able to perform any contract or tender that is awarded, to the required standard.

### 2.7.1 Pre-qualification

'**Pre-qualification'** in its broadest sense is the assessment of criteria for supplier 'suitability', so that only pre-screened, short listed, suppliers with certain minimum standards of capability, capacity and compatibility are invited or considered for participation in a given sourcing process.

### 2.7.2 Supplier Appraisal

**'Supplier appraisal'** or evaluation of potential suppliers, whether or not a separate prequalification is applied, in order to assess their capability and suitability, prior to entering into negotiation or other processes for supplier selection and contract award.

### 2.7.3 Factors to be Considered for Supplier Appraisal

Potential supplier may be appraised covering a wide and complex variety of factors that a purchaser may consider essential or desirable in its supplier. Criteria should be related to the requirements of the particular purchasing organisation and procurement type.

A comprehensive model frequently referred to in the procurement literature is the **'10 Cs'**[9], as follows:

i. **Capability** of the supplier to fulfilment the contract.

ii. **Capacity** of the supplier to meet purchaser's present and future needs.

iii. **Commitment** of the supplier to key values such as quality, service or cost management.

iv. **Control** systems in place to monitor and manage resources and risks.

v. **Cash** resources to ensure the financial status and stability of the supplier

vi. **Consistency** in delivery and improvement of quality and service

[9] Original Framework (Ray Carter)

vii. **Cost**: price, the whole life cost and value for money offered by the supplier

viii. **Compatibility** of the supplier with the buying organisation: both in terms of culture and technology.

ix. **Compliance** with environmental, corporate social responsibility or sustainability standards, legislation, and regulations

x. **Communication** efficiency and technology to support collaboration and coordination in the supply chain

## 2.8 Procurement Regulations and Procurement Methods

### 2.8.1 Procurement Regulations in Bangladesh Railway

In Bangladesh, government has passed procurement act and rules for the public sector procurement, in the name of 'the Public Procurement Act, 2006' (Act No 24 of 2006) and 'the Public Procurement Rules, 2008'. And these have been come into force on 31st January, 2008[10] .

### 2.8.2 Salient Features of the PPR, 2008

The salient features of the PPR, 2008

i. Annual Procurement Plan to be approved by the Head of the Procuring Entity or his Authorised Officer

ii. Tender Document based on Standard Tender Document published by the CPTU

iii. Preparation of Official Estimate for the procurement and to be kept confidential

iv. Invitation and Publication of Invitation for Tender (IFT) in prescribed manner, including publication in the CPTU website for high value procurement.

v. Tender selling, receiving, opening and evaluation

vi. Formation of Tender Opening Committee (TOC)

vii. Formation of Tender Evaluation Committee (TSC)

[10]SRO No. 21-law/2008 dated 24 January 2008.

viii. Awarding contract based on Technical and Financial criteria considering economic factors, not only lowest price.

ix. Approving Authority and Procedure for Approval, including timelines for each activity

x. Separation of levels from the Procuring Entity and the Approving Authority.

xi. Right to Complain by the aggrieved tenderer or supplier

xii. Publication of Contract Award

xiii. Contract Administration and Management.

xiv. Debriefing

xv. Safekeeping of Record of Procurement for Audit Trail

xvi. Post Procurement Review

xvii. Non Discrimination

xviii. Professional Misconduct, Conflict of Interest and Ethical Behaviour

### 2.8.3 Methods of Procurement

The PPR, 2008 describe the context, financial threshold, and procedure to be followed for any specific procurement. According to these rules tendering methods for procurement of goods are:

i. Open Tendering Method (OTM);

ii. Limited Tendering Method (LTM);

iii. Request for Quotation (RFQ);

iv. Two Stage Tendering Method (TSTM);

v. One Stage Two Envelope Tendering Method (OSTM); and

vi. Direct Procurement Method (DPM)

## 2.9 Supply Base Rationalisation and Supplier Tiering

### 2.9.1 Supply Base Rationalisation

The 'supplier base' is all the vendors that supply a given purchasing organisation. Supplier bases are often grouped in terms of location (local, international or global) and characteristics (diversified or specialised) or size (broad, narrow, single –sourced).

The purchaser can manage supply risk by having more potential suppliers of a given item or category of purchases, pre-qualified and approved as being able to meet its requirements. Another advantage of broadening the supply base is it enables the buyer to be more opportunistic: taking advantage of the best available price, trading terms, quality, innovation, and flexibility on offer.

Strong collaborative supplier relationships are used to narrow supply, enabling purchasing to be concentrated on smaller group of developed and trusted supply partners. However, a very narrow supplier base opens the buyer to the risks of over-dependence on a single supplier, in the event of supplier failure.

Supplier base rationalisation is concerned with determining roughly how many suppliers the buying organisation wants to deal with. This can be done by managing tiered supplier base.

### 2.9.2 Supplier Tiering

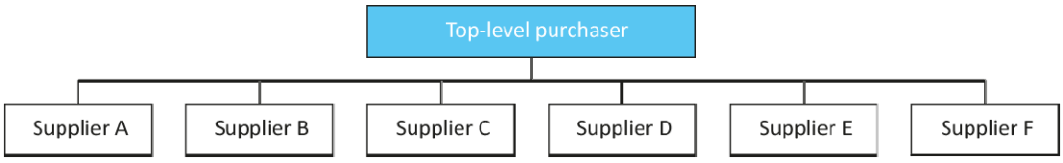
Supply base optimisation aims to manage the trade-off between:

(a) The desire to minimise the costs and complexity of managing a large supplier base and

(b) The desire to minimise the risks of having a very narrow supplier base.

If a manufacturer buys in parts from a number of suppliers, and assembles them through a number of stages to produce a finished product. The structure of the supply chain function in this is as illustrated in fig. 2.8.

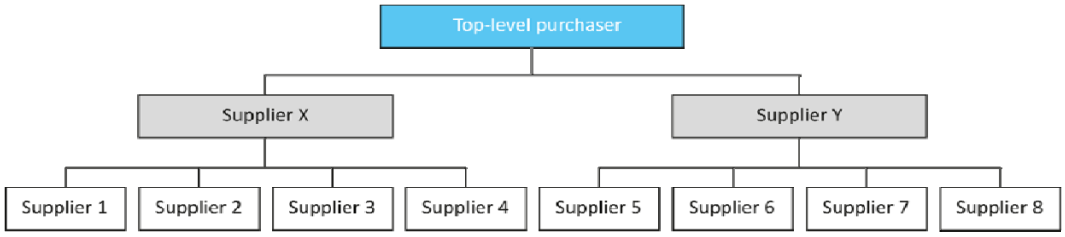
**Figure 9: Non-tiered Supply Base**




By contrast, if the same manufacturer sees strategic advantage in outsourcing all activities other than the final stages of production, in that case, its direct procurement relationship may be with a single supplier or tier of suppliers. Each supplier in the first tier would have

an extensive role to fulfil in the manufacture of the final product, making use of 'second-tier' suppliers as illustrated in fig. 2.9.

**Figure 10: Tiered Supply Base**




In a manufacturing operation such as an automobile manufacturer, the top-level purchaser is the "**Original Equipment Manufacturer"** (OEM) or assembler, which manages few numbers of specialist manufacturers of sub-assemblies. They will organise and manage a second tier of suppliers of component manufacturers, metal finishers, and so on, from which they can source required items on the OEM's behalf.

## 2.10 Managing Contract and Relationships with Suppliers

### 2.10.1 Contract Management

Contract Management is a process designed to ensure that both patties to a contract meet their obligations, and that the intended outcomes of a contract are delivered. It also involves building a good working relationship between the buyer and supplier, continuing through the life of a contract.

Once the contract has been awarded, the buyer accepts the following ongoing responsibilities:

- To maintain regular contract with the supplier
- To monitor the supplier's performance against the agreed terms and standards.
- To motivate the supplier
- To work with the supplier to solve any performance and relationship problems

### 2.10.2 Elements of Contract Management

Key elements of contract management are:

- **Contract development**: the formation of legally binding agreement, setting detailed terms of trade, and specifications of requirements.

- **Contract communication:** copies of the contract documents and delivery plans, and change orders should be distributed to those involved with managing them on day-today basis.

- **Contract administration:** the implementation of procedures, by buyer and supplier, to ensure that contract obligations are fulfilled. This may include procedure for:

    - Contract maintenance, updating and change control
    - Budgeting and monitoring of costs and charges
    - Ordering and payment procedures
    - Management reporting

- **Managing contract performance:** includes the following:

    - Risk management
    - Performance monitoring and measurements
    - Supplier motivation
    - Performance management

- **Relationship management:** It includes the following:

    - Developing working relationship through regular contract, communications, and information sharing.
    - Supplier performance measurement and vendor rating
    - Assessing right relationships: Transactional or long term collaborative relationships (e.g. outsource partnership etc.)
    - Supplier development (Training, giving opportunity to use purchasers resources, helping them to get finance from bank, etc)

- **Contract renewal or termination:** towards the end of the contract period, contract manger should review the contract in terms of success of the contract and relationships as well as the needs of supply, if need has been met, or performance

is unsatisfactory the contract may be terminated. Contract may be renewed, if ongoing need remains.

## 2.11 Risks, Hazards and Vulnerability in Procurements

**Risk** is 'the probability of an unwanted outcome happening'[11]. Probability is a measure of likelihood of occurring a given event or result. **Hazard** is 'source of potential harm'[12] **Vulnerability is** 'an area of weakness that can be exploited, which 'makes the risk greater'[13]

### 2.11.1 Categories of Risks

Risks may be categorised in the following broad heads: Strategic Risks, Operational Risks and hazards, Financial Risks, Compliance Risks.

#### Strategic Risks

Strategic risks arise from organisation's vision and direction, its positioning in a particular industry or market or geographic area. Examples of strategic risks include decisions about: Markets, Competitors, Technology, The economy, Consumer needs, corporate level legal issues and Merger and acquisition risks.

#### Operational Risks and Hazards

Operational risks arise from the functional, operational and administrative procedures by which organisational strategies are pursued. They primarily relate to the production and service delivery operations of the organisation. Example of operational risks include: Supply security, Supplier security, Quality, Delivery, Fraud, Health and safety, Transport and logistics, System and technology security, Weather and so on.

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[11] Managing Risks in Supply Chains (CIPS, 2012)
[12] ISO-31000
[13] Managing Risks in Supply Chains (CIPS, 2012)

### Financial Risks

Financial risks arise from internal financial structures of the business and the financial transactions with the external organisations. It may, also, come from the macro-economy of the country. Examples of financial risks include: Interest rate, Exchange rate, Cash flow and liquidity, Costs and credits.

### Compliance Risks:

Compliance risks arise from the need to ensure compliance with laws, regulations and policy frameworks; and the potential damage incurred by exposure of non-compliance or illegal activity by the organisation or its supply chains.

Examples of compliance risks include: Company law, Tax law and requirements, Environment regulations, Ethical standards and internal control, Employment law.

### 2.11.2 Fraud Risks in Procurement and Supply Chains

**Fraud** is 'an act of deliberate deception, with an intention of gaining some benefit'14. This is a key area of risk management, as it raises financial, compliance and reputational risk. Types of corruption and fraud are: Fraud, Bribery and Money laundering.

**Main Categories of Fraud:** In a corporate context, fraud generally falls into one of the following two main categories:

- **Removal of fund or assets from business**: examples include-
  - Theft of cash, goods, equipment or stationary
  - Over statement of expenses claims
  - Creation and payment against false invoices
  - Authorisation of salary payments to non-existent staff members and so on
- **Intentional misrepresentation:** examples include-
  - Omission or miss-recordings of company's account
  - Falsification of data in financial statements
  - Overstating profits or stock position

[14] Chambers Concise Dictionary.

## 2.12 Main Operational Risks in Supply Chains

### 2.12.1 Contract Failure Risks:

Contract failure means non-performance of the obligations of a contract. Contract is essentially a risk management tool. It is designed to minimise the risk of loss or damage to the organisation and its owners arising from-curtail or cease of activities owing to supply failure or disruption, lack of resources or breakdown in supplier relationships.

Risks of contract failure arise from supplier's reliability and performance and/or from the buyer's contract, project and supplier management policies and practices.

Contract failure risks might be rooted to the following risks:

- Poor contract development and contracting processes-e.g. ambiguous terms
- Unmanaged '**battle of the forms'**
- Poor Contract Administration and change control
- Lack of protection against IPR and confidentiality
- Issues of liability
- Applicable laws and jurisdiction
- Negotiation Risks

### 2.12.2 Financial Risks

Financial risks arise from internal financial structures of the business and the financial transactions with the external organisations. It may, also, come from the macro-economy of the country.

Examples of risks which arise from internal financial structure:

- Lack of price or cost analysis in setting or negotiating prices for a contract
- Lack of budgetary and cost control and management through the life cycle of the contract
- poorly designed financial control and procurement or payment procedure
- procurement and other financial fraud

Examples of risks which arise from external financial structure:

- **Macro-economic factor such as:** business cycles, fluctuation in the commodity price and exchange rate, availability and costs of finance

- **The financial strength, stability, and general health of suppliers:** Poor credit rating, high gearing ratio, cash flow problem, supplier insolvency leading to supply failure.

### 2.12.3 Currency and Exchange Rate Risk

One of the key considerations in international sourcing is the need to manage risks arising from exchange rates. Importers want the value of their domestic currency to be high as possible, so that their imports are cheaper in domestic terms. The position of the exporters will be just reversed.

Fluctuation in foreign exchange rates, therefore, represents a source of financial risks for purchasing organisations. An overseas supplier will normally quote their price in its own currency (FC), buyer will need to purchase FC in order to make payment. If the value of the domestic currency is weaken, the buyer will end up paying more. The risk is even greater if staged payments are to be made.

### 2.12.4 Managing Exchange Rate Risk:

There are numbers of ways of managing exchange rate risks:

- **Transfer the risk:** Transfer the risk to the supplier by getting them to quote in buyer's domestic currency.
- **Fixed Rate:** If the exchange rate is more or less stable, negotiate a fixed exchange rate applicable at the time of payment.
- **Leading payment:** Pay in advance, at the time of contract and do not wait for delivery, to take the advantage of positive low exchange rate.
- **Lagging payment:** Pay latter than agreed time, to take the advantage of exchange rate. There is a risk of reputational damage and it is also an ethical issue.
- **Hedging: Forward Exchange Contract:** Contract now to buy FC at a stated future date, at a rate agreed now. For example, a purchaser enters into a forward exchange contract on day-1, to purchase FC 1milion on day-60 at a rate fixed by the bank on day-1, to make payment to overseas supplier. There is a cost of doing so, but the uncertainty is removed. The purchaser knows on day-1 exactly how much its purchase will cost.
- If the risk is severe, consider temporarily **sourcing from domestic market**, if available or from a market with less volatility.

## 2.13 Supplier's Financial Instability

The risk of supplier encountering financial instability is a major focus of contract and supplier management. Financial information about suppliers can be obtained from various sources:

- Published financial statements and accounts: balance sheet, profit and loss account and cash flow statement
- Secondary data on suppliers: Analysis of financial statements and result in business and trade press published bespoke reports by research agencies-such as Dun & Bradstreet or Data Monitor.
- Credit rating companies
- Networking with other buyers who use the same suppliers
- Inviting supplier's financial director to make presentation on their financial status

### Signs of financial Instability of Suppliers

- It is not making profit or is experiencing falling profit margins or is making loss
- It is not managing cash flow or is experiencing a strong cash drain, making difficult to meet its short term liabilities (debts and expenses)
- It has more loan capitals than share capitals, incurring high finance costs performance
- Additional signs:
    - Rapid deterioration in delivery and quality performance
    - Senior managers leaving the business within a short period of time
    - Changes in the auditors and bankers of the firm
    - Adverse press reports
- Very slow responses to requests for information
- Problems in the supply chain e.g.- changes in subcontractor
- Chasing payment before it is due

## 2.14 Quality Failure Risks

**Right quality** is 'Fitness for purpose' or 'Conformance to requirements or specifications' or 'Comparative excellence'**.**

**Cost of quality**: Cost of ensuring and assuring quality. It involves:

Appraisal cost,

Prevention cost and Failure cost: internal failure cost + external failure cost.

Failure cost= internal failure cost + external failure cost

- **Internal Costs**
  - Loss or reworking
  - Scrapping
  - Re-inspection
  - Downgrading
  - Waste incurred in holding contingency stock
  - Time and cost of activities
- **External Costs**
  - Costs of reverse logistics
  - Cost of repairing and replacing
  - Cost of customer claims
  - Administrative costs of handling complaints
  - Cost of lost customer
  - Reputational damage due to dissatisfied customer and negative publicity

Therefore, cost of '**getting it wrong'** is generally greater than the cost of '**getting it right'** and that is why there has generally been an increase emphasis on **Quality Management System (QMS)**, with the aim of **'getting it right first time'**.

## 2.15 Quality Management

Basic two approaches for quality management are Quality Control (QC) and Quality Assurance (QA).

### 2.15.1 Quality Control

Quality Control is a system for the detection and correction of defects. This is essentially a reactive approach, focusing on:

- Establishing specification, standards and tolerances
- Sampling and inspection
- Identifying defective goods
- Scrapping or re-working

### 2.15.2 Quality Assurance

Quality Assurance is a system for the proactive prevention of defects. This is essentially a proactive and integrated approach to quality risk management, building quality in every stage of the process. It is a matter of '**building in quality'-** not' **weeding out defects'.** It focuses on:

- Product design
- Specification and contract
- Robust supplier selection and award
- Supplier development and management
- Continuous improvement and

### 2.15.3 Total Quality Management (TQM):

It refers to a radical approach to quality management, as a business philosophy. TQM is an orientation to quality in which quality values and aspirations are applied to the management of all resources and relationships within the firm-and throughout the supply chain, in order to seek continuous improvement and excellence al all aspects of performance.

## 2.16 Security of Supply Risks

Supply risk is the risk associated with suppliers being unable to supply or supplying goods inadequate quality. It may arise from:

- Poor supplier appraisal, selection and contracting
- Poor contract and/or supplier management
- Unanticipated level of demand
- Un anticipated shortage of material or price fluctuation due to environmental factors
- Unmanaged performance issues or quality and delivery
- Excessively lean supply
- Natural disaster
- Suppliers system failure
- Financial instability of supplier due to macro economic factors
- Increased logistics complexity and disruption of transportation links
- Lack of physical security of goods

## 2.17 Technology and Information Risks

Information risks may arise from:

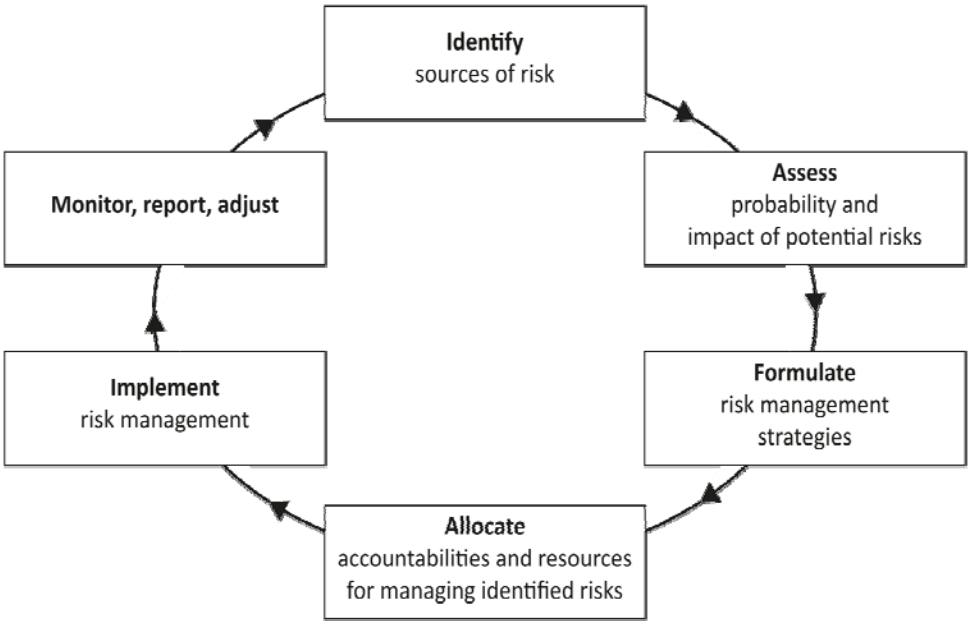
- Technology failure
- Hardware and software theft
- Cyber attack and data theft
- Implementation of new technology
- Information Risks
- Role of information Assurance

## 2.18 Managing Risks in Procurement

### 2.18.1 Risk Management Process

**Risk management** is 'the process whereby organisation methodically addresses the risks attaching to the activities with the goal of achieving sustained benefit within each activity and across the portfolio of all activities'[15]. It involves understanding and analysing the nature of the risks involved; calculating the possibility and impact of the risk event and developing options to offset or reduce the risks.

**Figure 11: Generic Risk Management Cycle**




[15] The Institute for Risk Management (IRM)

### 2.18.2 Risk Management Options

The objective of the risk management is, therefore, to arrive at a residual risk exposure which is acceptable to the organisations. Basic risk response options are:

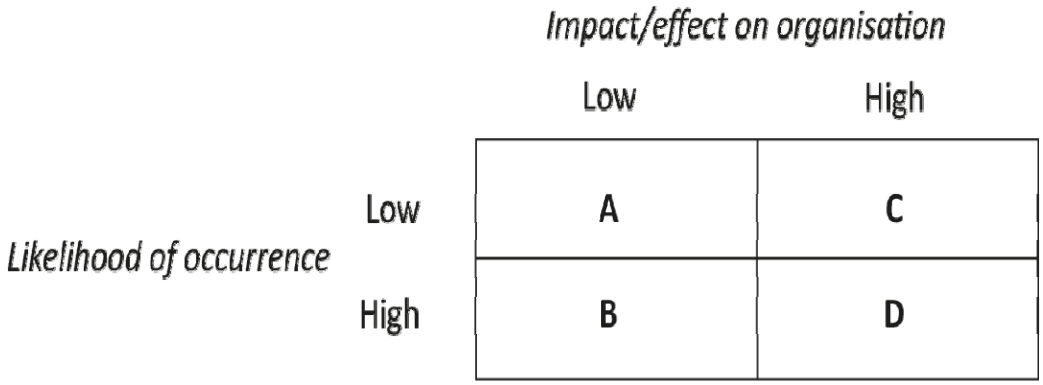
- ***Tolerate*** **(or accept) the risk:** if the assessed likelihood or impact of the risk is negligible (or there is no viable way to reduce the risk), no further action may, for the moment, be required, or justified

- ***Transfer*** **(or spread) the risk:** e.g. by taking out insurance cover, or not putting all supply eggs in one basket – or using contract terms to ensure that the costs of risk events will be borne by (or shared with) supply chain partners

- ***Terminate*** **(or avoid) the risk:** if the risk associated with a particular project or decision is too great, and cannot be reduced, the organisation may consider not investing or engaging in the activity or opportunity

- ***Treat*** **(mitigate, minimise or control) the risk:** take active steps to manage the risk in such a way as to reduce or minimise its likelihood or potential impact, or both.

**Figure 12: Risk Management Grid**




### 2.19 Corporate Governance and risk management:

Corporate governance refers broadly to 'the rules, policies, processes and organisational structures by which organisations are operated, controlled and regulated, to ensure that

they adhere to accepted ethical standard, good practices, laws and regulations'[16]. In Bangladesh the Public Procurement Act, 2006 and the Public procurement Rules, 2008 provide a major source of regulations for the procurement in the public sector. It defines the standard practice of procurement process. Many risks of procurement can be managed if it is followed.

### 2.19.1 Risk Management Tools:

**Developing mechanisms supportive for good governance in procurement:**

- A strong internal control environment designed to support business objectives and to identify area of risk:
- Development and application of codes of ethical conduct in procurement activities
- The effective budgeting, controlling, and monitoring of procurement spend across the organisation.
- Clearly defined roles, responsibilities, and accountabilities.
- Control over the authority levels of the individual procurement personnel.
- Clear requirements for approvals and authorisations of requisitions, procurements, and payments.
- The requirements of clear audit trails (record keeping)
- The segregation or division of procurement duties (award by higher authority than the procuring entity)
- Rotation of project buyers ( regular transfer of procurement personnel)
- Mandatory use of holiday allowances
- Control over preferred supplier list and single sourcing deals (administrative approval before starting direct procurement method)
- The use of e-procurement tools to minimise cash transactions.
- The use of physical security measures to protect asset, cash and data.
- The use of standard terms and conditions of contract
- Internal audit of procurement processes, decisions and controls.
- Encouraging employees and suppliers to report ethical breaches ('whistle blowing')
- Establishing an ethical forum or committee to discuss ethical issues and conflict of interests arising in course of work (code of ethics for procurement)

## 2.20 Procurement Performance: Customer Satisfaction

[16] Managing Risks in Supply Chains (CIPS, 2012)

Procurement performance measurement is the comparison of a procurement function's current performance against:

- Defined performance criteria (e.g. KPIs), to establish whether the aimed-for or agreed level of performance has been achieved.
- Previous performance, to identify deterioration or improvement trends.
- The performance of other procurement functions in the related area, or standard benchmarks, to identify areas where performance falls short of best practice.

### 2.20.1 Key Performance Indicators (KPI)

Different authors defined performance in different ways. According to Federal Highway Administration, U.S. Department of Transportation *(2009),* "Performance is a qualitative or quantitative measure of outcomes, outputs, efficiency, or cost-effectiveness". As per National Committee for Quality Assurance, USA *(2009)* "Performance is a quantifiable measure to assess how well the organization carries out specific functions or processes"

According to Chartered Institute of purchasing and Supply (CIPS), using Key Performance Indicators (KPI) is the best way to measure procurement performance of an organization (CIPS[17]*, 2011)*. Performance of two organizations can also be effectively compared through KPI.

Organization for Economic Co-operation and Development (OECD) together with the World Bank developed *(OECD[18]*, *2006)*a set of indicators to assess the national procurement capacity. These performance indicators are the basis for subsequent KPIs developed to measure the performance of public procurement. OECD performance indicators address the following areas of public procurement system. Subsequently, inspired by the OECD indicators, the World Bank uses the following 35 indicators while assessing the implementation of Public Procurement Regulations in Bangladesh (The World Bank[19], 2009).

## Table 2: Procurement Performance Indicators by World Bank

[17] Measuring Purchasing Performance (CIPS, 2011)
[18] Methodology for assessment of national procurement systems, 2006 (OECD)
[19] Assessment of Implementation of Public Procurement Regulations, 2009 (WB)

| Indicator # | Process/Area | Procurement Performance Indicator |
|---|---|---|
| 1. | Annual Procurement Plan | % of procuring entities prepared annual procurement plan |
| 2. | Contract packaging | % of contracts in a procurement plan Appropriately packaged. |
| 3. | Advertisement of tender opportunities in newspaper | % of open tender publicly advertised |
| 4. | Advertisement of tender opportunities in CPTU□s website | % of open tender (above threshold) advertised in CPTU's website |
| 5. | Multiple submission of tender | % of cases allowed submission of tenders in multiple locations. |
| 6. | Tender preparation time in open tendering method | Average number of days between IFB publication and tender submission deadline. |
| 7. | Tender preparation time compliance | % of cases allowed adequate time for tender preparation. |
| 8. | Sale of tender documents | Average number of tender documents sold |
| 9. | Tenderers' participation | Average number of tenderers submitting tenders. |
| 10. | Tender Opening Committee formation | % of cases TOC included at least one member from TEC. |
| 11. | Tender Evaluation Committee Formation | % of cases TEC formed by contract approving authority. |
| 12. | Outside member in TEC | % of cases TEC included two external |

| Indicator # | Process/Area | Procurement Performance Indicator |
|---|---|---|
| | | members outside the procuring entity. |
| 13. | Tender evaluation time | Average number of days between tender opening and completion of evaluation. |
| 14. | Compliance of tender evaluation time | % of cases tender evaluation has been completed within timeline. |
| 15. | Tender Acceptance | Average no. of responsive tenders |
| 16. | Re-tendering | % of cases TEC recommended for re-tendering |
| 17. | Tender Evaluation Approval Time | Average number of days taken by the approving authority. |
| 18. | Submission of evaluation report to appropriate authority | % of cases TEC submitted report directly to the approving authority. |
| 19. | TER approval compliance | % of cases contract award decision made within timeline by contract approving authority. |
| 20. | Additional review of TER | % of cases TER reviewed by person / committee other than the contract approving authority. |
| 21. | Tender processing lead time | Average number of days between tender opening and Notification of Award (NOA). |
| 22. | Publication of award information | % of contract awards published in CPTU□s website. |
| 23. | Efficiency in contract award | % of contracts awarded within initial tender |
| 24. | Opening of L/C | Average number of days taken between signing of contract and issue of L/C |
| 25. | Delivery time | % of contracts completed within original deadline. |
| 26. | Liquidated damage | % of cases liquidated damaged imposed for delayed delivery / completion. |

| Indicator # | Process/Area | Procurement Performance Indicator |
|---|---|---|
| 27. | Completion rate | % of contracts fully completed and accepted |
| 28. | Late Payment | % of contracts where payment made late. |
| 29. | Complaints | % of tender procedures with complaints |
| 30. | Resolution of Complaints | % cases complaints have been resolved |
| 31. | Independent Review Panel | % cases review panel's decision was upheld |
| 32. | Fraud & Corruption (F&C) | % of cases identified with F&C |
| 33. | Trained procurement staff | % of procuring entities with trained procurement staff. |
| 34. | Procurement post review | % of procuring entities conducted annual procurement post review. |
| 35 | Sub-delegation | % contract approved as per rule |

Central Procurement Technical Unit (CPTU), Govt. of Bangladesh maintains an online Procurement Management Information System (PROMIS) to measure the procurement performance of key government organizations. PROMIS measures procurement performance using 45 indicators *(SRGB, 2012).*

**Table 3: Procurement Performance Indicators by CPTU**

| SN. | Indicator Category | Process | Performance Indicator |
|---|---|---|---|
| 1 | Invitation for Tender | Advertisement of tender opportunities in Newspaper | Percentage of Invitation for Tender (IFT) published in newspaper |
| | | Advertisement of tender opportunities in CPTU website | Percentage of IFT(above threshold) advertised in CPTU□s website |
| | | Tenders following GoB procurement Rules | Percentage of Tenders following GoB procurement Rules |

| SN. | Indicator Category | Process | Performance Indicator |
|---|---|---|---|
| | | Tender following Development Partner Rules | Percentage of Tenders following Development Partner Rules |
| | | Multiple locations submission tenders | Percentage of tenders allowed to submit in multiple locations |
| | | Tender preparation time | Average number of days between |
| 2 | Tender Submission | in open tendering method | publishing of advertisement and tender submission deadline |
| | | Tender time compliance | Percentage of tenders having sufficient tender submission time |
| | | Sale of tender documents | Average number of tenderers purchased tender documents |
| | | Tenderer Participation | Average number of Tenderers submitted tenders |
| | | Tenderer Participation Index | Ratio of number of tender submission and number of tender document sold |
| 3 | Tender Opening Committee (TOC) and Tender Evaluation Committee (TEC) | Tender Opening Committee formation | Percentage of cases TOC included at least ONE member from TEC |
| | | Tender Evaluation Committee formation | Percentage of cases TEC formed by Contract Approving Authority |
| | | External member in TEC | Percentage of cases TEC included two external members outside the procuring entity |
| 4 | Tender Evaluation | Tender evaluation time | Average number of days between |

| SN. | Indicator Category | Process | Performance Indicator |
|---|---|---|---|
| | | | tender opening and completion of evaluation |
| | | Compliance of tender evaluation time | Percent of cases tender evaluation has been completed within timeline |
| | | Tender Acceptance | Average number of responsive tenders |
| | | Re-tendering | Percentage of cases TEC recommended re-tendering |
| | | Tender Cancellation | Percentage of cases where tender process cancelled |
| 5 | Tender Evaluation Report (TER) approval | Tender Evaluation Approval time | Average number of days taken between submission of Tender Evaluation and approval of contract |
| | | Compliance of financial Delegation | Average number of tenders approved by the proper financial delegated authority |
| | | Submission of evaluation report to appropriate Authority | Percentage of cases TEC submitted report directly to the contract approving authority |
| | | TER approval Compliance | Percentage of cases contract award decision made within timeline by |
| | | Additional review of TER Higher tier approval | Percentage of cases TER reviewed by person/committee other than the Contract Approving Authority<br>Percentage of tenders approved by higher tier than the Contract Approving Authority |

| SN. | Indicator Category | Process | Performance Indicator |
|---|---|---|---|
| 6 | Contract Award | Time for issuance of NOA to Tenderer | Average number of days between final approval and Notification of Award (NOA) |
| | | Tender processing lead time | Average number of days between tender opening and Notification of award (NOA) |
| | | Total tender processing time | Average number of days between Invitation for Tender (IFT) and Notification of Award |
| | | Publication of award information | Percentage of Contract awards published in CPTU□s website |
| | | Efficiency in Contract Award | Percentage of contracts awarded within initial tender validity period |
| 7 | Delivery/Completion | Delivery time | Percentage of Contracts completed/ delivered within the original schedule as mentioned in Contract |
| 8 | Payment | Liquidated damage | Percentage of Contracts having liquidated damage imposed for delayed delivery/completion |
| | | Completion rate | Percentage of Contracts fully completed and accepted |
| | | Payment release compliance | Average number of days taken to release payment |

| SN. | Indicator Category | Process | Performance Indicator |
|---|---|---|---|
| | | Late payment Interest paid for delayed payment | Percentage of cases (considering each instalment as a case) with delayed payment Percentage of Contracts where interest for delayed payments was Made |
| 9 | Complaints | Tender procedure complaints<br>Resolution of complaints with award modification | Percentage of tender procedures with complaints<br>Percentage of complaints resulting in modification of award |
| | | Resolution of complaints | Percentage of cases complaints have been resolved |
| | | Independent Review Panel | Percentage of cases review panel's decision upheld |
| 10 | Contract amendments | Contract Amendment/variation | Percentage of contract amendments/variations |
| 11 | Contract dispute resolution | Unresolved Disputes | Percentage of Contracts with unresolved disputes |
| 12 | Fraud and Corruption (F & C) | Fraud and Corruption | Percentage of cases F & C Detected |
| 13 | Procurement Management Capacity | Procurement training | Average number of trained procurement staff in each procuring Entity |
| | | | Percentage of procuring entity which has at least one trained/certified procurement staff |
| | | | Total number of procurement persons in the organization with procurement training. |

KPIs should be developed and used considering the context of the procurement.

# CHAPTER 3
# RESEARCH METHODOLOGY

## 3.1 METHODOLOGY

The study was explorative in nature and used qualitative and quantitative data. The main objective of the study was to explore the current situation of supply chain of locomotive spare parts. The study was focused on Procurement performance of the CCS for satisfying the needs of Pahartali Diesel Locomotive Workshop according to current recoupment policy. The evaluation was conducted on the basis of the KPIs covering the areas within the scope of the study.

| **For Foreign Item current procurement policy for recoupment** | **For local Item current procurement policy for recoupment** |
|---|---|
| Reopt: Minimum stock + Safety stock + Lead time = AMC x ( Minimum stock factor + | Reopt: Minimum stock + Safety stock + Lead time = AMC x ( Minimum stock factor + |
| Safety factor + lead time) | Safety factor + lead time) |
| Here, Minimum stock factor = 6 months | Here, Minimum stock factor = 3 months |
| Safety factor = 6 months | Safety factor = 2 months |
| lead time = 9 months | lead time = 3 months |
| Therefore, Reopt = AMC X ( 6+6+9) = 21 X AMC | Therefore, Reopt = AMC X (3+2+3) = 08 X AMC |
| Re- order Quantity ( ROQ): | Re- order Quantity ( ROQ): |
| ROQ = Reopt +Economical Procurable quantity - ( P.S +Dues ) + P.D ( If any ) | ROQ = Reopt + Procurable quantity - ( P.S +Dues ) + P.D ( If any ), where Procurable quantity = 4 months |
| = 21 X AMC + 6 X AMC - (P.S + Dues) + P.D ( If any ) | = 8 x AMC + 4 X AMC - (P.S + Dues) + P.D ( If any ) |
| =27 X AMC-(P.S + Dues) + P.D( If any ) | =12 X AMC-(P.S + Dues) + P.D( If any ) |
| Therefore ROQ = 27 X AMC (P.S + Dues ) + P.D ( If any ) | Therefore ROQ = 12 X AMC (P.S + Dues ) + P.D ( If any ) |

Reopt (Re order point) : It means the level of stock at which SR is to be placed for procurement.

Minimum stock : The level of stock beyond which the stock should not normally come down.

Safety factor : This is the stock to cover any risk to meet unforeseen demand and Supplier's failure to supply material within delivery period.

Lead time : Approximate time required for recoupment i.e. the period counted from the time of imitating SR to the time of receipt of material by the Stocking depot.

AMC : Average monthly consumption. It is normally calculated on 36 month's Consumption

ROQ : The Quantity for which SR is to be placed.

Procurable quantity : It is normally taken as 4 month's consumption for items to be procured under BSCIC rate contract & 6 month's consumption for items to be procured through tendering. But it may be changed by the purchaser.

The locomotive spares are considered as goods of specialised in nature and these are procured centrally by the CCS following Limited Tendering Method (International) and some are locally. Therefore, the KPIs were relevant to the LTM only. The chosen KPIs are shown below in the **Table-4**.

**Table 4: Key Performance Indicators**

| Area of Evaluation | KPIs |
|---|---|
| Transparency of Procurement Process | - % of IFT delivered to all the approved qualified potential tenderers<br>- % of IFT delivered directly to the approved potential foreign tenderers electronically<br>- % of items having single source<br>- % of tender cancelled due to unwanted political pressure |
| Efficiency of Procurement Process | - Average number of days between SR to Receive<br>- % of contract completed within timeline<br>- % of tender evaluation completed within timeline i.e. |

| Area of Evaluation | KPIs |
|---|---|
| | without extending the original tender validity |
| Adherence to the PPR | - Average time between pre-qualification and approval of new potential foreign tenderer<br>- % contract signed within 28 days of issuing NOA |
| Capacity of procurement management | - Average Number of IFT published per year by CCS<br>- Average Number of IFT published per year for the procurement of loco-spares<br>- % of budget remains unspent during the last three FY |
| HRM of Procurement function | - % of procurement personnel trained in PPR<br>- Number of training events conducted in the last FY to improve skill of the procurement personnel |
| ICT facilities in the procurement function | - Does CCS use MRP, MRP-II or ERP ?<br>- Number of training events conducted in the last FY to improve skill of the procurement personnel |
| Procurement Discipline | - Does CCS use Supplier tiering?<br>- Does CCS use vendor rating?<br>- Does CCS segment their procurement portfolio<br>- % of tender invited for long term collaborative basis with trusted suppliers, rather than inviting tender on 'one-off' basis?<br>- Does CCS conduct systematic risk assessment in the procurement of loco-spares? |
| Customer satisfaction | - Number of items made available 'On Time in Full' (OTIF)<br>- % of demand fulfilment<br>- % of out of stock items<br>- Number of rejection due to quality failure<br>- Number of delivery failed the 'need by date' |

## 3.2 Data Collection

To determine the KPIs both primary and secondary data were collected from the procuring entity and the user workshops. **Primary data** were collected, to capture data required to determine the chosen KPIs, through Numerical ledger (NL) card, questionnaires, meeting minutes of cross-functional teams on the procurement of vital spare-parts, While most of the answers were found from the respondent, some supplementary and missing information were collected from the respective tender files and minutes of the TEC. **Secondary data** were collected from the published Bangladesh Railway Information Books. A few tender cases were examined in detail to understand the whole procurement process, starting from the demand to the fulfilment, followed by the procuring office.

Finally, the Works Manager of Pahartali Diesel Workshop was interviewed to understand the insights of demand supply relationships with procurement function. Collected data and answers of the questionnaire were analysed meticulously to determine average lead times in each stage of procurement. Finally, the satisfaction level of the WM, DLW, PHT was determined in terms of the chosen KPIs.

## 3.3 Primary Data

Sources of primary data were: NL card, Mechanical Department information, Questionnaires.

### 3.3.1 Numerical Ledger (NL) Card Data

Diesel Stores Depot is managed by an Assistant Controller of Stores. There are NL cards for each item, on which the receipt, issue, and recoupment particulars are recorded. 469 different procurement history were selected randomly to collect detailed history of procurement. Numerical Ledger (NL) cards were examined and the dates of stage for the procurement cycle were recorded in a table 6. I have collected information regarding: dates of Stock Recoupment, Purchase Indent, and Received date from the NL cards. Collected data is shown in Table-6.

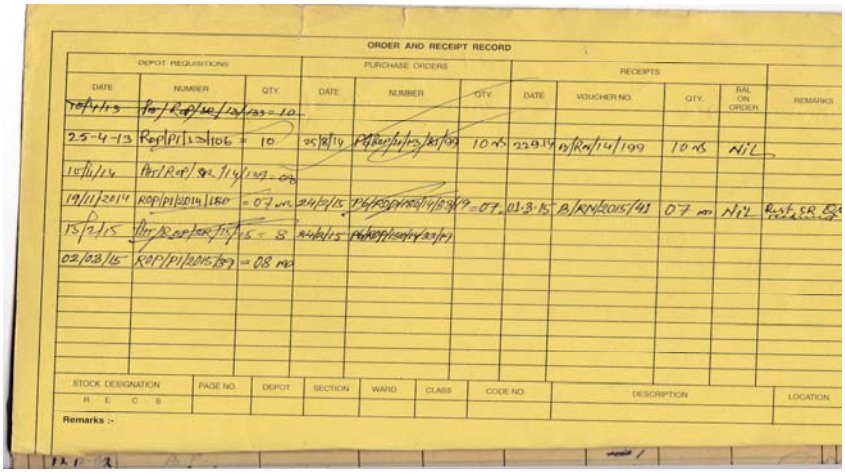



**Fig13: A sample Scan copy of Numerical Ledger (NL)**

## Questionnaires

### Questionaire-1: For the Procurement Office

Questionnaire-1 was prepared, to explore the current practice as well as the strength, weakness and challenges in the procurement practice of the CCS. The questionnaire-1 is annexed in **Appendix-A.**

### Questionaire-2: For the Diesel Workshop

Questionnaire-2 was prepared, to explore the current satisfaction level of the WM, DL, PHT as a customer of the procurement function of BR. The questionnaire-2 is annexed in **Appendix-B.**

### Questionaire-3: For the Procurement/ Maintenance Expert

Questionnaire-3 was prepared for collecting expert opinion, to understand the views of them about the current procurement system as well as how the system can be improved, in order to enhance spares availability in time and customer satisfaction. The questionnaire-3 is annexed in **Appendix-C.** The target people were ex-procurement personnel who worked in the procurement of loco-spares and worked in the loco-maintenance workshop of BR.

### 3.3.2 Meeting on Procurement Position of the Vital Spares

I have attended few cross functional meetings with the officials of the workshop and the procurement function. I have gone through the minutes of these minutes to understand the challenges present in the system, and the ways they overcome the challenges.

### 3.3.3 Tender Case Study

A few tender cases were studied by the researcher to understand the sourcing, supplier appraisal, tender evaluation, award criteria and contract management processes.

## 3.4 Secondary Data

Sources of secondary data were: published railway information book, prequalification documents, BRASS.

### 3.4.1 Bangladesh Railway Information Books:

BR publishes a book named Bangladesh Railway Information Book which contains a lot of information. I have collected statistics related to locomotive and procurement from the Railway Information Book, 2014.

### 3.4.2 Pre-qualification Documents for the Enlistment of Suppliers

BR approves a list of suppliers as Approved Qualified Potential Suppliers for the procurement of loco-spares. To understand the enlistment procedure, I have studied the Prequalification Documents they used for the Invitation of Application for Enlistment. I have gone through the minutes of the evaluation committee and acquired hand on knowledge over the prequalification procedure.

### 3.4.3 BRASS- Bangladesh Railway automated Support System

BR uses customised SQL Server based web application software for inventory management. I have collected some data from the Deputy Director Inventory Control, BR, CRB, Chittagong, which was generated by running reports of the software by him. The address of that site is www.brass-online.net which is restricted limited user of Bangladesh railway.

## 3.5 Data Analysis and Reporting

Detailed analyses were made by studying the primary and secondary data thoroughly, and testing the consistency of data. Some data found to be redundant and those were omitted and emphasise were given to the ultimate goal of this study. Aspects that were looked into were: time taken to complete each segment of procurement cycle, adherence to the regulations, challenges, and risks in the procurement, transparency, and efficiency of the procurement process, way of improvements, etc. The collected information was tabulated for further analysis. The results are shown in **Table-7.** From the primary and secondary data different KPIs were calculated to determine the results.

# CHAPTER 4

# DATA ANALYSIS AND RESULT DISCUSSION

## 4.1 Exploring Current Recoupment Situation

### 4.1.1 Inventory Management

BR has about 277 numbers of diesel electric locomotives, which are of more than 19 categories. In 2016 total number of Spare parts for diesel locomotive is 27102 for maintenance purpose. Which is very high comparative to number of locomotives? Each year CCS has to buy more than 4000 items of spares for these locomotives. For the diesel workshop, Pahartali there are about 2731 of stock items, out of which more than 600 items are used regularly, which have to stock at the feeding diesel stores depot. Demand for the stock items are generated according to the actual consumption in the workshop.

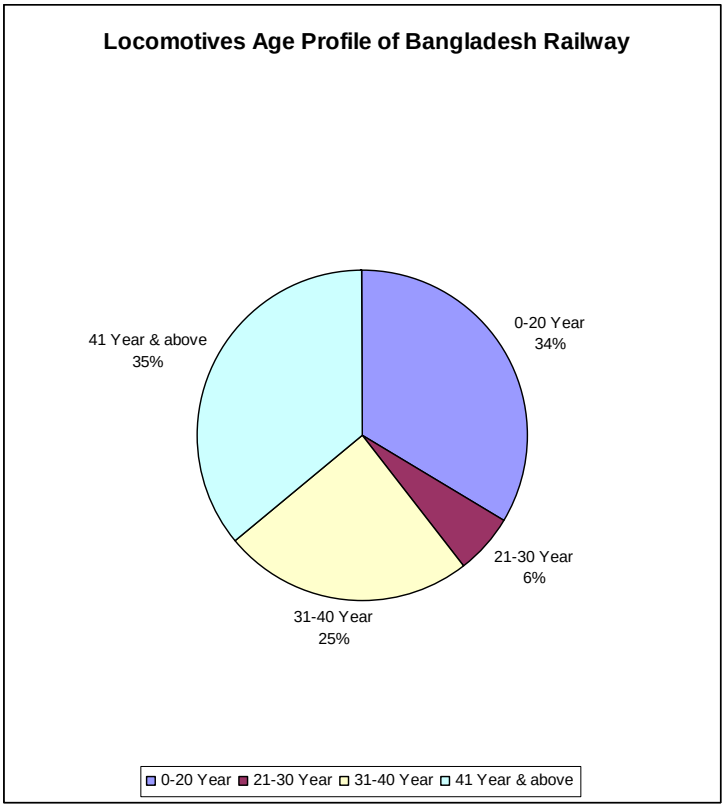



**Fig14: Locomotives age profile of Bangladesh Railway**

**Table:5**

**BANGLADESH RAILWAY**

**AGE WISE LOCOMOTIVE HOLDING**

**( AS ON 31.01.2016)**

**Locomotive Economic Life=20 Years**

| Gauge | Sl. No. | Loco Class | Series | Horse Power | Year Built | Fleet Size | Off Schedule | Active Holding | Age Profile | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 0-20 Year | 21-30 | 31-40 | 41 & above |
| **Meter Gauge** | 1 | MEG-11 | 2000 | 1125 | 1953 | 12 | 1 | 11 | | | | 12 |
| | 2 | MEG-9 | 2200 | 875 | 1963 | 36 | 0 | 36 | | | | 36 |
| | 3 | MEM-14 | 2300 | 1380 | 1969 | 21 | 0 | 21 | | | | 21 |
| | 4 | MEM-14 | 2400 | 1380 | 1978 | 11 | 0 | 11 | | | 11 | |
| | 5 | MEE-5 | 3100 | 500 | 1971 | 0 | 0 | 0 | | | | 0 |
| | 6 | MEH-14 | 2500 | 1350 | 1981 | 17 | 0 | 17 | | | 17 | |
| | 7 | MHZ-5 | 3200 | 500 | 1980 | 6 | 0 | 6 | | | 6 | |
| | 8 | MHZ-8 | 3300 | 800 | 1982 | 7 | 3 | 4 | | 0 | 7 | |
| | 9 | MEG-15 | 2600 | 1500 | 1988 | 16 | 0 | 16 | | 16 | | |
| | 10 | MEL-15 | 2700 | 1500 | 1995 | 21 | 0 | 21 | 21 | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 11 | MED-14 | 2800 | 1149 | 1996 | 10 | 0 | 10 | 10 | | | |
| | 12 | MEI-15 | 2900 | 1500 | 1999 & 2005 & 2011& 2013 | 39 | 0 | 39 | 39 | | | |
| | | | | | **Sub Total A=** | **196** | **4** | **192** | **70 (36%)** | **16 (08%)** | **41 (21%)** | **69 (35%)** |
| **Broad Gauge** | 13 | BEA-20 | 6000 | 2000 | 1966 | 17 | 0 | 17 | | | | 17 |
| | 14 | BEM-20 | 6100 | 2000 | 1970 | 14 | 0 | 14 | | | | 14 |
| | 15 | BEH-24 | 6200 | 2450 | 1981 | 12 | 0 | 12 | | | 12 | |
| | 16 | BEB-22 | 6300 | 2250 | 1981 | 12 | 0 | 12 | | | 12 | |
| | 17 | BED-26 | 6400 | 2600 | 2001 | 13 | 0 | 13 | 13 | | | |
| | 18 | BED-26 | 6500 | 3100 | 2013 | 10 | 0 | 10 | 10 | | | |
| | 19 | BHZ-5 | 7000 | 500 | 1980 | 3 | 0 | 3 | | | 3 | |
| | | | | | **Sub Total B=** | **81** | **0** | **81** | **23 (29%)** | **0 (0%)** | **27 (33%)** | **31(38%)** |
| | | | | | **Grand Total=(Sub Total A +Sub Total B)** | **277** | **4** | **273** | **93 (34%)** | **16 (06%)** | **68 (24%)** | **100 (36%)** |

The figures show inefficiency in inventory management compare to its limited number of Locomotives. In ideal case there should be limited number of various types of locomotives rather than we see here that Bangladesh railway have 19 type of locomotive which create 27102 numbers of different spare parts for 19 type's locomotive maintenance. Again most of the locomotive is out of its economic life which create more operational failure of locomotive as a result become create situation to more schedule maintenance which need more spare parts to procure.

BR uses '**Push Inventory Management'** for DLW, Pahartali and the stock recoupment system falls in the category of '**Fixed Order Quantity'** system as described below.

The Depot Officer of the feeding stores depot (ACOS/DL/PHT) places SR, when the stock level comes to, or below, a prefixed Re-order Point (REOPT). The Re-order point is calculated as follows:

**REOPT**[20]=Minimum stock + Safety stock + Stock in lead time

=AMC×(Minimum stock factor + Safety factor + Lead time)

Where, **Minimum stock**: The level of stock beyond which the stock should not normally come down.

**Safety stock:** This is the stock to cover any risk to meet unforeseen demand & supplier's failure to supply material within delivery period.

**Lead time:** Approximate time required for recoupment i.e. the period counted from the time of initiating stock recoupment to the time of receipt of material by stocking depot.

**AMC**: Average monthly consumption i.e. average materials consumed during the last three years and total month of present years.

Re-order quantity (ROQ) is calculated as:

**ROQ** = REOPT + EOQ - (P.S+ DUES) + P.D

Where, P.S. = Present Stock; P.D.= Pending Demand; For materials procurable from foreign source, it is assumed that Minimum stock factor = 6 month, Safety factor = 6 month and Lead time= 9 month

[20] Revised Procedure Order No 234/A

Therefore, for foreign sourced loco spares:

**REOPT** = 21 × AMC and

**ROQ** = 27 × AMC - (P.S+ DUES) + P.D (if any)

Where, EOQ=Economical procurable quantity = 6 × AMC

After getting SR, DIC prepares the final PI (Purchase indent) and sends it to CCS office for procurement.

**Classification and Codification of Spares for Inventory Policy**

BR classified spare parts with emphasize given on maintenance. But classifications and codification of stores for inventory policy are absent in the inventory management of BR.

### 4.1.2 Identification of Spare-parts

The loco-spares are identified by the part number given in the parts catalogue supplied by the Original Equipment Manufacturer (OEM) or the Locomotive Assembler. The detailed specification against part number is not available to BR, and it is not possible to get as these are highly technical and business confidential. But the output of few big components can be known to BR. BR uses the part number of the spare as the basis for identification and tendering. BR does not allow alternative or equivalent part number by the supplier while receiving tenders, except the superseded number given by the OEMs. The standard practice is each part has its part number given by individual manufacturer and order placed to a manufacturer mentioning the specific part number used by the manufacturer. Therefore, all suppliers and their manufacturers are approved against the same part number for an item. This is a considerable deviation from standard business practice. BR codified items giving 7-digit numerical number. But the codification is not done in a systematic manner to identify loco-class, for what component, what source of procurement, or what inventory management applies to the item.

### 4.1.3 Tendering Method and Tender Document :

Loco-spares are not available in the local market and can be procured from the few manufacturers, situated in the geographically dispersed locations of the world, Specifications of loco-spares are not available to BR, and these are manufactured using

high technical capability that is why these are considered as the goods of specialised nature. Under the provisions of PPR, procurement of loco-spares falls in the category of Limited Tendering. International LTMs (International) are being invited from the approved qualified potential tenderers on item by item basis i.e. each item is considered as a separate lot. Standard Tender Document–PG4 is being used with appropriate adjustment for the LTM tender. Tender Documents are being given to the local agent of the approved supplier and the foreign suppliers are being informed through e-mail along with a list of tendered items. Tenders are evaluated following the procedure prescribed in the PPR.

### 4.1.4 Pre-qualification and Enlistment of Potential Source of Supply:

To identify the potential sources of supply and to invite tenders under rules-63(2) and 86 of the PPR, 2008, prequalification is done by CCS. The qualified applicants are approved by the DG and CCS enlists them as 'Approved Qualified potential Tenders' for the procurement of the loco-spares During approval the supplier is given approval against a specific manufacturer and they are being allowed to quote on the lines for which they are approved and the quoted manufacturers must match with the manufacture against which they have been given approval. The list is updated on regular intervals and the latest approved list is made in 2013.

Previously spares were procured by CCS only the OEMs or the assemblers and before 2005, there were no enlistment. After introducing the PPR, 2008 the enlistment application were invited from the manufacturers, distributors of the manufacturers along with the OEMs and assemblers.

BR has some 700 items approved for procurement from the local BSCIC approved manufacturers. There is a standing policy of for the approval and the interested manufacturers may apply any time for getting approval as local supplier. There is no standing policy for pre-qualification and approval for foreign source of supply.

### 4.1.5 Major Tender and Contract Terms

There are more than 40 numbers of general conditions of contracts, but following are the important specific conditions of the contract, used at present as contract terms and conditions:

- More than 90% of the spares procured from the foreign source. And these are procured

using CFR/Chittagong Sea Port (INCOTERM-2010).

- Payment is made through irrevocable letter of credit (L/C) to the amount of 100% of quoted price on the production of shipping documents.
- Delivery period is 10 months from the date of opening L/C
- Pre-shipment inspection is not required, but a certificate by the manufacturer is needed to the effect that the goods supplied are manufactured by them and the spares are as per the part number of the tendered item(s).
- The shipping documents must include: Manufactures Certificate as per merchandise list to the effect that the goods corresponds to the part number of the tendered item. And the country of origin certificate from the Chambers of Commerce of the country of shipment.
- The warranty period is one year from the issue of receipt note by DCOS (Shipping)
- Free delivery to CTG i.e. DDP/CTG is not acceptable.
- There is no need for tender security but performance security to the amount of 10% of the contract value is required and the currency of the performance security must be same as the currency of the contract with the supplier.
- There is no option for submitting tenders electronically by the foreign suppliers.
- Only authorised person is allowed to sign in the tender and contract between BR and Suppliers.

### 4.1.6 Inspection and Quality Control

As pre-shipment inspection is not performed, the purchaser asks for a certificate from the manufacturer to the effect that they have manufactured the supplied spares and the supplied spares are new and as per the part number of the tendered item(s.

When shipping document is delivered by the L/C opening bank to the purchaser (CCS), the documents are checked. If all the documentation requirements are fulfilled, quality of the goods are considered okay and then the documents are accepted by the CCS. District Controller of Stores (shipping), BR, Pahartali acts as a clearing agent for BR and he is the final inspector for the goods procured. Payment is made before the goods are accepted by the inspector. DCOS (Shipping) has no instrument to ensure quality of loco-spares, but to

send the spares to the stocking depot. When issued to workshop the spares are finally checked practically installing in locomotive. If it is found defective, a complaint is raised and the depot officer prepares Manuscript Memorandum of Differences (MDM) and sends the materials to DCOS (Shipping) for replacement with correct materials. The purchaser is the final authority to for disposal of the MDM.

The manufacturers certificate regarding conformance to quality and warranty certificate as to replace defective spare-parts are the tools for assuring quality and the practical test by the consumer is only tool for ensuring quality. Therefore, the quality of the supplied spare basically based on the trust between the supplier and buyer. That is why this type of procurement is highly vulnerable to the risk of wrong and inferior supply. Scrutiny of shipping documents is highly essential in all consignments. Presently shipping documents in all consignments are not sending to CCS for acceptance.

### 4.1.7 Procurement Discipline

The study revealed that CCS dos not practice supplier base rationalisation and supplier tiering. There is no systematic process of vendor rating to measure existing supplier's performance. CCS does not segment the procurement portfolio for strategic procurement planning and tenders are invited only for 'one-off' basis, not for long-term collaborative basis. CCS does not conduct any systematic risk assessment in the procurement of loco-spares. They use Standard Tender Documents, which cover most of the issues that need to be addressed for sustainable contract management.

Detailed specifications of spares are not available to BR. Spares are detected and procured on the basis of the part number mentioned in the parts-catalogue given by the loco-suppliers at the time of procurement of locomotives. The part number is given by the **OEM**, and ideally, the part number should be used in the communication with the original manufacturer as they have given these. No manufacturers, other than the OEM, should know and recognise the part number. BR uses the same part number in the communications with all the approved suppliers. This is a major deviation with the standard business practice. This may have give birth to increased wrong supply by the approved suppliers, who supplies spares from non- OEMs. The number of MDMs is considerably increasing in the recent years.

## 4.2 Procurement performance Measurement

### Efficiency in Procurement Processing

To measure the efficiency of the procurement processes of CCS, the researcher collected data about the whole procurement cycle for randomly selected 469 different procurement cycles in 174 numbers of items from 1989 to 2016 which has regular consumption by Pahartali Depot. The lead time calculations are shown in **Table-7** in the next page. After analysing the data from the data tables and consulting respective tender case files for the missing data, following KPIs are calculated on the basis of consistent data:

**Table 6: Procurement lead time History of 469 cycle procurement (randomly selected items in different period of time from 1989 to 2016)**

| Serial No | BR Item NO | Description | Unit | ZONE | Stock Requisition dt | Indent date | Receive date | Curre ncy | Last unit price | number of item receive | Total month required |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 410030 | WHEEL | Nos | Foreign | 17/06/2000 | 17/06/2000 | 30/10/2010 | $ | 500 | 252 | 124Months |
| 2 | 410030 | WHEEL | Nos | Foreign | 11/04/2010 | 11/04/2010 | 07/04/2011 | $ | 5.4 | 10 | 12Months |
| 3 | 410030 | WHEEL | Nos | Foreign | 12/02/1995 | 12/02/1995 | 07/02/1996 | $ | 38.59 | 8 | 12Months |
| 4 | 410030 | WHEEL | Nos | Local | 16/07/2003 | 01/03/1903 | 12/07/2004 | $ | 15.65 | 22 | 12Months |
| 5 | 410030 | WHEEL | Nos | Foreign | 12/01/1994 | 12/01/1994 | 15/02/1995 | $ | 462 | 325 | 13Months |
| 6 | 410030 | WHEEL | Nos | Foreign | 10/11/2008 | 05/10/2008 | 15/12/2009 | $ | 7.02 | 13 | 13Months |
| 7 | 410030 | WHEEL | Nos | Local | 23/06/2009 | 15/01/2008 | 17/07/2010 | $ | 111.2 | 8 | 13Months |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 911590 | GASKET | Nos | Local | 22/02/2004 | 16/07/2003 | 27/03/2005 | $ | 16.43 | 4 | 13Months |
| 9 | 911781 | GASKET RING,1-7/16 IN O.D | Nos | Local | 10/06/2002 | 10/06/2002 | 11/08/2003 | $ | 27 | 48 | 14Months |
| 10 | 912030 | GASKET | Nos | Foreign | 16/08/2003 | 20/9/2016 | 06/02/2016 | $ | 46 | 150 | 150Months |
| 11 | 912030 | GASKET | Nos | Foreign | 17/06/2000 | 17/06/2000 | 06/09/2001 | $ | 3.99 | 220 | 15Months |
| 12 | 912030 | GASKET | Nos | Foreign | 16/08/2003 | 09/08/2003 | 28/11/2004 | $ | 0.28 | 4 | 15Months |
| 13 | 912030 | GASKET | Nos | Foreign | 15/09/2008 | 29/04/2008 | 15/12/2009 | $ | 2.12 | 10 | 15Months |
| 14 | 912030 | GASKET | Nos | Local | 05/06/2012 | 07/08/2011 | 22/09/2013 | $ | 13.8 | 80 | 15Months |
| 15 | 912696 | SEAL | Nos | Local | 12/03/2002 | 12/03/2002 | 19/06/2003 | $ | 297.64 | 2 | 15Months |
| 16 | 914373 | O RING, 1/2 IN O.D. | Nos | Foreign | 25/03/1996 | 25/03/1996 | 24/07/1997 | $ | 618.76 | 217 | 16Months |
| 17 | 914373 | O RING, 1/2 IN O.D. | Nos | Foreign | 28/01/2008 | 20/10/2007 | 04/05/2009 | $ | 0.06 | 352 | 16Months |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 18 | 914410 | O-RING 13/16 IN OD | Nos | Foreign | 01/09/2001 | 30/01/2000 | 12/01/2003 | $ | 0.23 | 10 | 16Months |
| 19 | 914410 | O-RING 13/16 IN OD | Nos | Foreign | 28/05/2002 | 28/05/2002 | 15/09/2003 | $ | 0.02 | 200 | 16Months |
| 20 | 914410 | O-RING 13/16 IN OD | Nos | Foreign | 09/04/1991 | 09/04/1991 | 24/08/1992 | $ | 150.78 | 7 | 16Months |
| 21 | 914410 | O-RING 13/16 IN OD | Nos | Foreign | 26/06/2003 | 19/03/2003 | 12/10/2004 | $ | 0.55 | 15 | 16Months |
| 22 | 914527 | DIAPHRAGM | Nos | Local | 03/11/2007 | 04/03/2007 | 01/03/2009 | $ | 73.58 | 12 | 16Months |
| 23 | 914527 | DIAPHRAGM | Nos | Local | 15/12/2004 | 22/02/2004 | 17/04/2006 | $ | 0.06 | 400 | 16Months |
| 24 | 914527 | DIAPHRAGM | Nos | Local | 09/04/1991 | 09/04/1991 | 24/08/1992 | $ | 0.78 | 25 | 16Months |
| 25 | 914527 | DIAPHRAGM | Nos | Local | 09/04/1991 | 09/06/1991 | 24/08/1992 | $ | 7 | 10 | 16Months |
| 26 | 914527 | DIAPHRAGM | Nos | Foreign | 05/02/2003 | 19/03/2003 | 12/07/2004 | $ | 0.55 | 14 | 17Months |
| 27 | 914527 | DIAPHRAGM | Nos | Foreign | 17/09/2007 | 09/01/2007 | 23/02/2009 | $ | 56.06 | 65 | 17Months |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 28 | 914540 | O-RING 1-3/8 IN O.D. | Nos | Local | 11/05/2003 | 10/05/2003 | 18/10/2004 | $ | 21.83 | 4 | 17Months |
| 29 | 914540 | O-RING 1-3/8 IN O.D. | Nos | Local | 23/06/2009 | 24/02/2010 | 03/11/2010 | $ | 4.7 | 66 | 17Months |
| 30 | 914630 | RING, PACKING 1-1/8" O.D. | Nos | Local | 12/03/2002 | 12/03/2002 | 18/08/2003 | $ | 30 | 90 | 17Months |
| 31 | 914630 | RING, PACKING 1-1/8" O.D. | Nos | Local | 05/08/2009 | 28/06/2009 | 29/01/2011 | $ | 140.88 | 2 | 17Months |
| 32 | 914630 | RING, PACKING 1-1/8" O.D. | Nos | Foreign | 11/05/2003 | 13/04/2003 | 08/11/2004 | $ | 2.65 | 6 | 18Months |
| 33 | 914630 | RING, PACKING 1-1/8" O.D. | Nos | Foreign | 11/05/2003 | 11/05/2003 | 08/11/2004 | $ | 0.16 | 40 | 18Months |
| 34 | 914960 | O RING, 3/4IN O.D | Nos | Foreign | 16/10/2000 | 16/10/2000 | 29/04/2002 | $ | 20.53 | 76 | 18Months |
| 35 | 914960 | O RING, 3/4IN O.D | Nos | Foreign | 21/01/2013 | 11/10/2011 | 05/07/2014 | $ | 3.28 | 12 | 18Months |
| 36 | 915010 | O RING , 7/16 IN O.D | Nos | Foreign | 04/06/2008 | 24/07/2008 | 15/12/2009 | $ | 0.067 | 200 | 18Months |
| 37 | 915010 | O RING , 7/16 IN O.D | Nos | Foreign | 25/09/2003 | 09/11/2003 | 07/03/2005 | $ | 591 | 10 | 18Months |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 38 | 915010 | O RING , 7/16 IN O.D | Nos | Foreign | 16/08/2003 | 09/08/2003 | 10/02/2005 | $ | 5.63 | 5 | 18Months |
| 39 | 915010 | O RING , 7/16 IN O.D | Nos | Local | 23/10/2010 | 24/02/2010 | 24/04/2012 | $ | 9.51 | 205 | 18Months |
| 40 | 915220 | O RING, 3/8 IN O.D. | Nos | Local | 24/02/2010 | 23/06/2009 | 10/08/2011 | $ | 2.76 | 93 | 18Months |
| 41 | 915220 | O RING, 3/8 IN O.D. | Nos | Local | 11/09/2000 | 11/09/2000 | 19/03/2002 | $ | 252.52 | 40 | 18Months |
| 42 | 915300 | RING, 1-7/16 IN O.D. | Nos | Foreign | 08/01/1995 | 08/01/1995 | 28/08/1996 | $ | 810 | 125 | 19Months |
| 43 | 917095 | GASKET | Nos | Foreign | 30/09/2010 | 15/10/2009 | 24/04/2012 | $ | 2.09 | 11 | 19Months |
| 44 | 917095 | GASKET | Nos | Foreign | 12/06/2003 | 29/04/2003 | 18/01/2005 | $ | 0.54 | 50 | 19Months |
| 45 | 917095 | GASKET | Nos | Foreign | 01/09/2010 | 27/01/2010 | 24/04/2012 | $ | 2.9 | 176 | 19Months |
| 46 | 918361 | GASKET | Nos | Foreign | 16/07/2003 | 14/08/2003 | 13/02/2005 | $ | 591 | 3 | 19Months |
| 47 | 925105 | SPRING | Nos | Local | 14/05/2002 | 14/05/2002 | 07/12/2003 | $ | 20.19 | 5 | 19Months |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 48 | 1085010 | BUFFER SLY | Nos | Local | 29/09/2010 | 15/10/2009 | 24/04/2012 | $ | 134.92 | 5 | 19Months |
| 49 | 1085010 | BUFFER SLY | Nos | Local | 10/11/2008 | 05/10/2008 | 27/06/2010 | $ | 5.03 | 61 | 19Months |
| 50 | 1085010 | BUFFER SLY | Nos | Local | 06/05/2008 | 04/06/2008 | 15/12/2009 | $ | 2.87 | 4 | 19Months |
| 51 | 1601210 | SEAL - INNER | Nos | Local | 03/02/2009 | 24/02/2009 | 29/09/2010 | $ | 397.5 | 2 | 19Months |
| 52 | 1601210 | SEAL - INNER | Nos | Local | 09/05/1994 | 09/05/1994 | 04/12/1995 | $ | 3.46 | 240 | 19Months |
| 53 | 1601210 | SEAL - INNER | Nos | Local | 26/09/2004 | 16/07/2003 | 18/04/2006 | $ | 728.71 | 2 | 19Months |
| 54 | 1603020 | SWITCH, COMPRESSOR | Nos | Local | 24/01/2010 | 29/04/2009 | 10/08/2011 | $ | 13.16 | 32 | 19Months |
| 55 | 1603890 | BEARING ASSY. JOURNAL | Nos | Local | 24/01/2008 | 28/11/2007 | 08/02/2010 | $ | 0.09 | 500 | 25Months |
| 56 | 1603890 | BEARING ASSY. JOURNAL | Nos | Foreign | 05/10/2008 | 18/08/2008 | 27/06/2010 | $ | 186.97 | 6 | 20Months |
| 57 | 1603890 | BEARING ASSY. JOURNAL | Nos | Foreign | 05/10/2008 | 29/04/2008 | 27/06/2010 | $ | 26.81 | 15 | 20Months |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 58 | 1604980 | ELEMENT - FILTER | Nos | Foreign | 05/10/2008 | 29/04/2008 | 27/06/2010 | $ | 26.81 | 15 | 20Months |
| 59 | 1604980 | ELEMENT - FILTER | Nos | Local | 01/12/2002 | 01/12/2002 | 18/08/2004 | $ | 21.83 | 3 | 20Months |
| 60 | 1604980 | ELEMENT - FILTER | Nos | Local | 04/07/2006 | 25/07/2006 | 16/03/2008 | $ | 5.01 | 195 | 20Months |
| 61 | 1604980 | ELEMENT - FILTER | Nos | Local | 28/05/2002 | 10/06/2002 | 03/01/2004 | $ | 2.57 | 0 | 20Months |
| 62 | 1604980 | ELEMENT - FILTER | Nos | Local | 06/01/2004 | 18/01/2003 | 05/09/2005 | $ | 13.25 | 50 | 20Months |
| 63 | 1604980 | ELEMENT - FILTER | Nos | Local | 30/05/2001 | 30/05/2001 | 14/01/2003 | $ | 18.1 | 20 | 20Months |
| 64 | 1604980 | ELEMENT - FILTER | Nos | Local | 05/07/1998 | 05/07/1998 | 07/03/2000 | $ | 13.09 | 40 | 20Months |
| 65 | 1604980 | ELEMENT - FILTER | Nos | Foreign | 28/02/2011 | 30/08/2010 | 28/11/2012 | $ | 0.58 | 2 | 21Months |
| 66 | 1604980 | ELEMENT - FILTER | Nos | Foreign | 06/06/1995 | 06/06/1995 | 15/03/1997 | $ | 3.55 | 39 | 21Months |
| 67 | 1604980 | ELEMENT - FILTER | Nos | Foreign | 11/10/2006 | 18/04/2006 | 22/07/2008 | $ | 7.42 | 29 | 21Months |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 68 | 1604980 | ELEMENT - FILTER | Nos | Foreign | 14/12/2008 | 08/11/2008 | 29/09/2010 | $ | 0.12 | 32 | 21Months |
| 69 | 1604980 | ELEMENT - FILTER | Nos | Foreign | 12/03/2008 | 29/04/2008 | 15/12/2009 | $ | 2.12 | 10 | 21Months |
| 70 | 1604980 | ELEMENT - FILTER | Nos | Foreign | 24/02/2011 | 07/09/2009 | 03/11/2012 | $ | 1.94 | 149 | 21Months |
| 71 | 1604980 | ELEMENT - FILTER | Nos | Foreign | 30/05/2001 | 30/05/2001 | 03/02/2003 | $ | 0.69 | 190 | 21Months |
| 72 | 1604980 | ELEMENT - FILTER | Nos | Foreign | 29/06/2006 | 13/05/2006 | 16/03/2008 | $ | 8.82 | 9 | 21Months |
| 73 | 1604980 | ELEMENT - FILTER | Nos | Foreign | 18/01/2003 | 18/01/2003 | 12/10/2004 | $ | 554 | 0 | 21Months |
| 74 | 1604980 | ELEMENT - FILTER | Nos | Local | 30/08/2010 | 03/11/2009 | 31/05/2012 | $ | 48.2 | 71 | 21Months |
| 75 | 1604980 | ELEMENT - FILTER | Nos | Foreign | 13/09/2007 | 06/05/2007 | 27/07/2009 | $ | 0.26 | 16 | 22Months |
| 76 | 1609980 | BOLT CAP | Nos | Foreign | 04/01/2009 | 13/01/2009 | 27/11/2010 | $ | 0.04 | 209 | 22Months |
| 77 | 1609980 | BOLT CAP | Nos | Foreign | 08/11/1997 | 08/11/1997 | 21/09/1999 | $ | 0.55 | 25 | 22Months |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 78 | 1609980 | BOLT CAP | Nos | Foreign | 08/11/1997 | 08/11/1997 | 21/09/1999 | $ | 0.55 | 25 | 22Months |
| 79 | 1609980 | BOLT CAP | Nos | Foreign | 11/01/2010 | 12/02/2010 | 29/11/2011 | $ | 8.7 | 63 | 22Months |
| 80 | 1609980 | BOLT CAP | Nos | Foreign | 23/11/2011 | 10/11/2011 | 22/09/2013 | $ | 27.19 | 15 | 22Months |
| 81 | 1612270 | RETAINER SPRING | Nos | Foreign | 03/04/2006 | 15/01/2005 | 06/02/2008 | $ | 73.69 | 4 | 22Months |
| 82 | 1612270 | RETAINER SPRING | Nos | Foreign | 06/05/2007 | 21/04/2007 | 17/03/2009 | $ | 91.87 | 8 | 22Months |
| 83 | 1612270 | RETAINER SPRING | Nos | Local | 26/09/2007 | 01/02/2007 | 15/07/2009 | $ | 1.1 | 158 | 22Months |
| 84 | 1612700 | BOLT - 9/16-18 X 3-1/2 | Nos | Local | 16/07/2003 | 25/06/2002 | 16/05/2005 | $ | 1350 | 2 | 22Months |
| 85 | 1612700 | BOLT - 9/16-18 X 3-1/2 | Nos | Foreign | 11/03/2003 | 11/05/2003 | 13/02/2005 | $ | 3.19 | 18 | 23Months |
| 86 | 1612700 | BOLT - 9/16-18 X 3-1/2 | Nos | Foreign | 08/10/2008 | 14/12/2008 | 29/09/2010 | $ | 0.3 | 61 | 23Months |
| 87 | 1612700 | BOLT - 9/16-18 X 3-1/2 | Nos | Foreign | 18/06/1991 | 18/06/1991 | 26/05/1993 | $ | 4.79 | 5 | 23Months |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 88 | 1612700 | BOLT - 9/16-18 X 3-1/2 | Nos | Foreign | 28/11/2000 | 28/11/2000 | 20/10/2002 | $ | 0.55 | 31 | 23Months |
| 89 | 1612700 | BOLT - 9/16-18 X 3-1/2 | Nos | Foreign | 21/04/2007 | 06/05/2007 | 01/03/2009 | $ | 3.63 | 25 | 23Months |
| 90 | 1612700 | BOLT - 9/16-18 X 3-1/2 | Nos | Foreign | 08/06/2005 | 21/06/2005 | 13/05/2007 | $ | 689 | 7 | 23Months |
| 91 | 1612700 | BOLT - 9/16-18 X 3-1/2 | Nos | Foreign | 14/12/2008 | 22/11/2008 | 27/11/2010 | $ | 7.77 | 8 | 23Months |
| 92 | 1612700 | BOLT - 9/16-18 X 3-1/2 | Nos | Foreign | 21/06/2005 | 04/06/2005 | 22/05/2007 | $ | 0.42 | 8 | 23Months |
| 93 | 1613726 | SOCK ABSORBER | Nos | Local | 21/06/2005 | 04/06/2005 | 22/05/2007 | $ | 0.42 | 8 | 23Months |
| 94 | 1613726 | SOCK ABSORBER | Nos | Local | 12/08/2012 | 23/11/2011 | 05/07/2014 | $ | 8.8 | 72 | 23Months |
| 95 | 1613726 | SOCK ABSORBER | Nos | Local | 03/12/2004 | 24/07/2004 | 08/11/2006 | $ | 35.58 | 88 | 23Months |
| 96 | 1613740 | VALVE | Nos | Local | 16/07/2003 | 15/06/2003 | 08/06/2005 | $ | 140.05 | 1 | 23Months |
| 97 | 1613740 | VALVE | Nos | Local | 24/02/2010 | 15/10/2009 | 23/01/2012 | $ | 4.99 | 164 | 23Months |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 98 | 1613740 | VALVE | Nos | Local | 24/02/2010 | 29/04/2010 | 23/01/2012 | $ | 4.99 | 192 | 23Months |
| 99 | 1613740 | VALVE | Nos | Local | 28/10/1997 | 28/10/1997 | 21/09/1999 | $ | 17.33 | 33 | 23Months |
| 100 | 1613790 | CAP | Nos | Foreign | 24/03/1992 | 24/03/1992 | 29/03/1994 | $ | 5885 | 52 | 24Months |
| 101 | 1613840 | STOP CHECK | Nos | Foreign | 15/04/2004 | 22/02/2004 | 17/04/2006 | $ | 1.11 | 128 | 24Months |
| 102 | 1613840 | STOP CHECK | Nos | Foreign | 22/03/2007 | 06/05/2007 | 17/03/2009 | $ | 0.61 | 24 | 24Months |
| 103 | 1613840 | STOP CHECK | Nos | Foreign | 10/04/2002 | 17/03/2002 | 05/04/2004 | $ | 6.57 | 19 | 24Months |
| 104 | 1613870 | INJECTOR VALVE ASSY. | Nos | Local | 27/01/2010 | 13/01/2010 | 23/01/2012 | $ | 3.95 | 70 | 24Months |
| 105 | 1613870 | INJECTOR VALVE ASSY. | Nos | Local | 04/06/2008 | 22/04/2008 | 27/06/2010 | $ | 4 | 3 | 24Months |
| 106 | 1614370 | WEAR PLATE | Nos | Local | 25/09/2008 | 05/10/2008 | 29/09/2010 | $ | 9.45 | 49 | 24Months |
| 107 | 1614370 | WEAR PLATE | Nos | Local | 25/09/2008 | 05/10/2008 | 29/09/2010 | $ | 9.45 | 49 | 24Months |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 108 | 1614370 | WEAR PLATE | Nos | Local | 12/11/2008 | 10/11/2008 | 03/11/2010 | $ | 12.85 | 30 | 24Months |
| 109 | 1614400 | WEAR PLATE | Nos | Foreign | 16/01/2000 | 16/01/2000 | 13/02/2002 | $ | 0.55 | 50 | 25Months |
| 110 | 1614400 | WEAR PLATE | Nos | Foreign | 25/01/2008 | 17/09/2007 | 20/02/2010 | $ | 63.79 | 36 | 25Months |
| 111 | 1614400 | WEAR PLATE | Nos | Foreign | 10/12/2006 | 21/10/2004 | 31/01/2009 | $ | 2.42 | 200 | 25Months |
| 112 | 1614400 | WEAR PLATE | Nos | Foreign | 22/02/2004 | 19/08/2006 | 18/03/2006 | $ | 10 | 20 | 25Months |
| 113 | 1614400 | WEAR PLATE | Nos | Foreign | 17/01/2008 | 03/03/2008 | 07/02/2010 | $ | 660 | 0 | 25Months |
| 114 | 1614400 | WEAR PLATE | Nos | Foreign | 28/11/2007 | 26/09/2007 | 15/12/2009 | $ | 200.29 | 10 | 25Months |
| 115 | 1614400 | WEAR PLATE | Nos | Local | 07/09/2009 | 23/06/2009 | 10/10/2011 | $ | 134.92 | 10 | 25Months |
| 116 | 1614400 | WEAR PLATE | Nos | Local | 06/04/2011 | 12/02/2011 | 04/05/2013 | $ | 30 | 80 | 25Months |
| 117 | 1614400 | WEAR PLATE | Nos | Local | 04/06/2007 | 08/07/2007 | 18/07/2009 | $ | 5.01 | 195 | 25Months |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 118 | 1614860 | DUCT FLEXIBLE | Nos | Local | 05/07/2007 | 14/08/2007 | 12/08/2009 | $ | 2.87 | 0 | 25Months |
| 119 | 1614860 | DUCT FLEXIBLE | Nos | Local | 24/04/2002 | 14/05/2002 | 23/05/2004 | $ | 273.75 | 0 | 25Months |
| 120 | 1615420 | GAUGE | Nos | Local | 11/09/2000 | 11/09/2000 | 20/10/2002 | $ | 256.03 | 0 | 25Months |
| 121 | 1615420 | GAUGE | Nos | Local | 22/02/2004 | 16/07/2003 | 18/03/2006 | $ | 11.2 | 70 | 25Months |
| 122 | 1615700 | GASKET - MOUNTING | Nos | Local | 06/05/2007 | 21/04/2007 | 15/06/2009 | $ | 6.86 | 97 | 25Months |
| 123 | 1615700 | GASKET - MOUNTING | Nos | Foreign | 15/06/2004 | 09/03/2004 | 29/08/2006 | $ | 5.25 | 6 | 26Months |
| 124 | 1615700 | GASKET - MOUNTING | Nos | Foreign | 22/02/2004 | 14/01/2004 | 17/04/2006 | $ | 2.87 | 200 | 26Months |
| 125 | 1615700 | GASKET - MOUNTING | Nos | Foreign | 15/09/2007 | 22/10/2007 | 10/11/2009 | $ | 0.61 | 40 | 26Months |
| 126 | 1618100 | BUTTON | Nos | Foreign | 03/11/1996 | 03/11/1996 | 28/01/1999 | $ | 4.15 | 26 | 26Months |
| 127 | 1618100 | BUTTON | Nos | Foreign | 24/02/2010 | 24/01/2010 | 24/04/2012 | $ | 1.26 | 3 | 26Months |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 128 | 1618100 | BUTTON | Nos | Foreign | 13/03/2004 | 28/04/2004 | 31/05/2006 | $ | 1257.6 | 3 | 26Months |
| 129 | 1618940 | VALVE | Nos | Foreign | 10/03/1999 | 10/03/1999 | 28/05/2001 | $ | 138.88 | 2 | 26Months |
| 130 | 1618970 | VALVE, AIR GOVERNOR. | Nos | Foreign | 04/06/2007 | 08/07/2007 | 24/08/2009 | $ | 60 | 20 | 26Months |
| 131 | 1618970 | VALVE, AIR GOVERNOR. | Nos | Foreign | 18/06/2007 | 08/07/2007 | 30/08/2009 | $ | 154.28 | 9 | 26Months |
| 132 | 1619410 | OIL BLOWER END OF SHAFT | Nos | Local | 15/10/2009 | 07/09/2009 | 12/12/2011 | $ | 134.92 | 10 | 26Months |
| 133 | 1619820 | GASKET - BEARING HOUSING | Nos | Local | 17/12/2007 | 28/11/2007 | 28/02/2010 | $ | 111.2 | 25 | 26Months |
| 134 | 1619820 | GASKET - BEARING HOUSING | Nos | Local | 16/02/2004 | 22/02/2004 | 17/04/2006 | $ | 1.8 | 400 | 26Months |
| 135 | 1619820 | GASKET - BEARING HOUSING | Nos | Local | 22/02/2004 | 06/01/2004 | 17/04/2006 | $ | 1.1 | 400 | 26Months |
| 136 | 1619860 | GASKET | Nos | Local | 07/02/2008 | 03/03/2008 | 05/04/2010 | $ | 368.99 | 3 | 26Months |
| 137 | 1620190 | BRUSH - CARBON - | Nos | Local | 24/02/2010 | 07/02/2010 | 24/04/2012 | $ | 357.84 | 6 | 26Months |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 138 | 1620190 | BRUSH - CARBON - | Nos | Local | 21/04/2007 | 09/01/2007 | 15/06/2009 | $ | 34.57 | 20 | 26Months |
| 139 | 1620190 | BRUSH - CARBON - | Nos | Local | 23/06/2009 | 08/06/2009 | 10/08/2011 | $ | 189 | 21 | 26Months |
| 140 | 1620190 | BRUSH - CARBON - | Nos | Local | 21/04/2007 | 21/11/2006 | 17/06/2009 | $ | 7.8 | 40 | 26Months |
| 141 | 1620190 | BRUSH - CARBON - | Nos | Foreign | 13/09/2009 | 10/11/2008 | 04/12/2011 | $ | 0.15 | 40 | 27Months |
| 142 | 1620190 | BRUSH - CARBON - | Nos | Foreign | 29/09/2010 | 12/05/2010 | 05/12/2012 | $ | 3.98 | 5 | 27Months |
| 143 | 1620261 | DISC - VALVE - OUTER | Nos | Foreign | 22/02/2004 | 23/07/2006 | 18/05/2006 | $ | 3.19 | 40 | 27Months |
| 144 | 1620270 | GASKET - SEAT | Nos | Foreign | 10/12/2006 | 18/06/2005 | 01/03/2009 | $ | 1.22 | 800 | 27Months |
| 145 | 1620270 | GASKET - SEAT | Nos | Foreign | 21/06/2011 | 18/05/2011 | 22/09/2013 | $ | 27.19 | 16 | 27Months |
| 146 | 1620490 | SEAL - PISTON COOLING | Nos | Foreign | 07/09/2009 | 24/08/2009 | 12/12/2011 | $ | 0.28 | 48 | 27Months |
| 147 | 1620520 | BRIDGE, EXHAUST VALVE | Nos | Local | 07/09/2009 | 24/08/2009 | 12/12/2011 | $ | 0.28 | 48 | 27Months |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 148 | 1620520 | BRIDGE, EXHAUST VALVE | Nos | Local | 04/03/2007 | 07/02/2007 | 15/06/2009 | $ | 33.62 | 16 | 27Months |
| 149 | 1625220 | GASKET | Nos | Local | 09/09/1997 | 09/09/1997 | 27/12/1999 | $ | 18.47 | 9 | 27Months |
| 150 | 1625220 | GASKET | Nos | Local | 28/11/2007 | 26/09/2007 | 09/02/2010 | $ | 1.26 | 100 | 27Months |
| 151 | 1625220 | GASKET | Nos | Local | 28/11/2007 | 26/09/2007 | 08/02/2010 | $ | 1423.91 | 2 | 27Months |
| 152 | 1626220 | BRUSH CARBON REG | Nos | Local | 29/04/2009 | 03/03/2009 | 11/07/2011 | $ | 3.95 | 90 | 27Months |
| 153 | 1626220 | BRUSH CARBON REG | Nos | Local | 15/01/2008 | 03/12/2007 | 05/04/2010 | $ | 30 | 96 | 27Months |
| 154 | 1626220 | BRUSH CARBON REG | Nos | Local | 15/01/2008 | 15/01/2008 | 05/04/2010 | $ | 25.9 | 0 | 27Months |
| 155 | 1626220 | BRUSH CARBON REG | Nos | Local | 28/02/2002 | 28/09/2002 | 10/05/2004 | $ | 7.41 | 10 | 27Months |
| 156 | 1626220 | BRUSH CARBON REG | Nos | Foreign | 22/10/2007 | 18/08/2007 | 28/02/2010 | $ | 45.15 | 26 | 28Months |
| 157 | 1627070 | CONTACTOR | Nos | Foreign | 20/02/2007 | 21/11/2006 | 17/06/2009 | $ | 74.74 | 5 | 28Months |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 158 | 1628630 | SCREEN | Nos | Foreign | 24/07/2004 | 26/06/2004 | 08/11/2006 | $ | 0.53 | 3 | 28Months |
| 159 | 1629650 | CARBON BRUSH | Nos | Foreign | 28/04/1991 | 28/04/1991 | 25/08/1993 | $ | 32.59 | 8 | 28Months |
| 160 | 1629650 | CARBON BRUSH | Nos | Local | 17/01/2010 | 24/02/2010 | 31/05/2012 | $ | 2 | 0 | 28Months |
| 161 | 1629650 | CARBON BRUSH | Nos | Local | 18/10/2009 | 03/11/2009 | 01/02/2012 | $ | 268 | 0 | 28Months |
| 162 | 1629840 | FELT GEAR & PINION SIDE | Nos | Local | 21/08/2009 | 07/09/2009 | 12/12/2011 | $ | 4.42 | 116 | 28Months |
| 163 | 1629850 | FELT WHEEL SIDE | Nos | Local | 07/09/2009 | 23/06/2009 | 24/01/2012 | $ | 48.2 | 81 | 28Months |
| 164 | 1629850 | FELT WHEEL SIDE | Nos | Foreign | 24/02/2009 | 15/02/2009 | 11/07/2011 | $ | 2 | 55 | 29Months |
| 165 | 1630170 | WICK ASSY | Nos | Foreign | 09/01/2007 | 10/12/2006 | 15/06/2009 | $ | 1.18 | 20 | 29Months |
| 166 | 1630170 | WICK ASSY | Nos | Foreign | 22/02/2004 | 07/12/2005 | 04/07/2006 | $ | 79.59 | 60 | 29Months |
| 167 | 1630170 | WICK ASSY | Nos | Foreign | 11/10/2006 | 07/08/2012 | 17/03/2009 | $ | 9.92 | 22 | 29Months |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 168 | 1630170 | WICK ASSY | Nos | Foreign | 06/09/2007 | 28/11/2007 | 09/02/2010 | $ | 660 | 0 | 29Months |
| 169 | 1630170 | WICK ASSY | Nos | Local | 22/02/2004 | 06/01/2004 | 04/07/2006 | $ | 33.01 | 12 | 29Months |
| 170 | 1630170 | WICK ASSY | Nos | Local | 15/12/1997 | 15/12/1997 | 09/05/2000 | $ | 15.77 | 6 | 29Months |
| 171 | 1630170 | WICK ASSY | Nos | Local | 31/07/1997 | 31/07/1997 | 29/12/1999 | $ | 1684.82 | 2 | 29Months |
| 172 | 1630920 | RING - PISTON COMP. | Nos | Local | 13/07/2010 | 09/05/2010 | 05/12/2012 | $ | 256.5 | 40 | 29Months |
| 173 | 1630920 | RING - PISTON COMP. | Nos | Foreign | 17/10/2005 | 07/12/2005 | 16/04/2008 | $ | 22.45 | 2 | 30Months |
| 174 | 1630920 | RING - PISTON COMP. | Nos | Foreign | 19/03/2003 | 20/03/2003 | 05/09/2005 | $ | 0.731 | 40 | 30Months |
| 175 | 1630920 | RING - PISTON COMP. | Nos | Foreign | 05/10/2008 | 29/04/2008 | 25/04/2011 | $ | 7.23 | 42 | 30Months |
| 176 | 1630920 | RING - PISTON COMP. | Nos | Foreign | 15/10/2009 | 15/10/2009 | 22/04/2012 | $ | 1 | 1465 | 30Months |
| 177 | 1631140 | SEAL - OIL | Nos | Foreign | 14/08/2007 | 20/11/2013 | 14/02/2010 | $ | 126.23 | 1 | 30Months |

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| 178 | 1631820 | BEARING - SHELL - | Nos | Foreign | 17/01/2008 | 12/03/2008 | 18/07/2010 | $ | 0.48 | 78 | 30Months |
| 179 | 1631820 | BEARING - SHELL - | Nos | Local | 10/11/2008 | 25/10/2008 | 22/05/2011 | $ | 7.39 | 90 | 30Months |
| 180 | 1632010 | LEAD ACID HEAVY DUTY | Nos | Local | 19/03/2003 | 19/03/2003 | 05/09/2005 | $ | 0.07 | 72 | 30Months |
| 181 | 1632010 | LEAD ACID HEAVY DUTY | Nos | Local | 11/11/2010 | 12/05/2010 | 04/05/2013 | $ | 4.8 | 155 | 30Months |
| 182 | 1632010 | LEAD ACID HEAVY DUTY | Nos | Local | 16/03/2003 | 19/03/2003 | 05/09/2005 | $ | 277.67 | 5 | 30Months |
| 183 | 1632010 | LEAD ACID HEAVY DUTY | Nos | Local | 20/10/2003 | 20/10/2003 | 18/04/2006 | $ | 19.99 | 0 | 30Months |
| 184 | 1632010 | LEAD ACID HEAVY DUTY | Nos | Local | 31/12/2011 | 16/01/2012 | 12/06/2014 | $ | 163.66 | 0 | 30Months |
| 185 | 1632010 | LEAD ACID HEAVY DUTY | Nos | Foreign | 12/01/2010 | 15/08/2009 | 12/08/2012 | $ | 4.22 | 57 | 31Months |
| 186 | 1632010 | LEAD ACID HEAVY DUTY | Nos | Foreign | 22/01/2006 | 27/12/2005 | 06/08/2008 | $ | 0.12 | 9 | 31Months |
| 187 | 1632010 | LEAD ACID HEAVY DUTY | Nos | Foreign | 04/06/2005 | 05/05/2005 | 23/01/2008 | $ | 0.21 | 25 | 31Months |

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| 188 | 1632010 | LEAD ACID HEAVY DUTY | Nos | Foreign | 27/01/2010 | 24/02/2010 | 11/08/2012 | $ | 0.06 | 50 | 31Months |
| 189 | 1632010 | LEAD ACID HEAVY DUTY | Nos | Foreign | 25/05/1991 | 25/05/1991 | 06/12/1993 | $ | 31.25 | 2 | 31Months |
| 190 | 1632010 | LEAD ACID HEAVY DUTY | Nos | Local | 21/11/2006 | 11/11/2006 | 15/06/2009 | $ | 33.62 | 11 | 31Months |
| 191 | 1632010 | LEAD ACID HEAVY DUTY | Nos | Local | 23/06/2009 | 02/06/2009 | 24/01/2012 | $ | 0.62 | 32 | 31Months |
| 192 | 1632040 | SPRING - VALVE | Nos | Local | 12/02/2011 | 11/01/2011 | 22/09/2013 | $ | 24.93 | 100 | 31Months |
| 193 | 1632040 | SPRING - VALVE | Nos | Foreign | 11/04/2010 | 15/02/2010 | 05/12/2012 | $ | 2.13 | 3 | 32Months |
| 194 | 1632410 | CHARGING | Nos | Foreign | 19/07/2006 | 11/10/2006 | 01/03/2009 | $ | 7.2 | 21 | 32Months |
| 195 | 1632750 | BAR | Nos | Foreign | 13/09/2009 | 15/10/2009 | 31/05/2012 | $ | 0.13 | 60 | 32Months |
| 196 | 1633090 | HOLDER | Nos | Foreign | 31/08/2009 | 15/10/2009 | 22/04/2012 | $ | 1.5 | 678 | 32Months |
| 197 | 1633090 | HOLDER | Nos | Foreign | 01/01/2004 | 22/02/2004 | 18/09/2006 | $ | 88.73 | 6 | 32Months |

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| 198 | 1633150 | CARBON BRUSH | Nos | Foreign | 11/04/2010 | 15/02/2010 | 05/12/2012 | $ | 100.01 | 5 | 32Months |
| 199 | 1633150 | CARBON BRUSH | Nos | Local | 13/07/2008 | 24/07/2008 | 22/03/2011 | $ | 4.46 | 0 | 32Months |
| 200 | 1633150 | CARBON BRUSH | Nos | Foreign | 11/03/2010 | 11/04/2010 | 05/12/2012 | $ | 0.1 | 57 | 33Months |
| 201 | 1633150 | CARBON BRUSH | Nos | Foreign | 21/12/2005 | 22/01/2006 | 16/09/2008 | $ | 0.64 | 44 | 33Months |
| 202 | 1633150 | CARBON BRUSH | Nos | Foreign | 30/11/2009 | 18/10/2009 | 29/08/2012 | $ | 65.58 | 15 | 33Months |
| 203 | 1633150 | CARBON BRUSH | Nos | Foreign | 15/10/2009 | 15/10/2009 | 11/08/2012 | $ | 0.1 | 250 | 34Months |
| 204 | 1633150 | CARBON BRUSH | Nos | Foreign | 15/10/2009 | 12/09/2009 | 11/08/2012 | $ | 1.55 | 30 | 34Months |
| 205 | 1633401 | resistor 50 ohms | Nos | Foreign | 25/06/2005 | 09/07/2005 | 16/04/2008 | $ | 5.25 | 22 | 34Months |
| 206 | 1633401 | resistor 50 ohms | Nos | Foreign | 24/01/2008 | 14/12/2008 | 03/11/2010 | $ | 1.09 | 10 | 34Months |
| 207 | 1633620 | RESISTOR (HEAD LIGHT) | Nos | Local | 22/01/2008 | 10/11/2008 | 03/11/2010 | $ | 0.76 | 11 | 34Months |

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| 208 | 1633620 | RESISTOR (HEAD LIGHT) | Nos | Foreign | 06/09/2005 | 17/08/2005 | 06/08/2008 | $ | 0.18 | 41 | 35Months |
| 209 | 1633690 | COMMUTATOR L0AD | Nos | Foreign | 30/08/1998 | 25/06/2005 | 12/07/2001 | $ | 6 | 50 | 35Months |
| 210 | 1633790 | BOX | Nos | Foreign | 06/07/2004 | 09/01/2007 | 15/06/2007 | $ | 2.42 | 120 | 35Months |
| 211 | 1633790 | BOX | Nos | Local | 09/08/1997 | 09/08/1997 | 06/07/2000 | $ | 1844.29 | 1 | 35Months |
| 212 | 1633820 | GUIDE ASSY | Nos | Foreign | 29/03/2000 | 29/03/2000 | 12/03/2003 | $ | 37.05 | 12 | 36Months |
| 213 | 1633820 | GUIDE ASSY | Nos | Foreign | 22/09/2005 | 31/08/2005 | 16/09/2008 | $ | 6.65 | 5 | 36Months |
| 214 | 1633820 | GUIDE ASSY | Nos | Foreign | 10/11/2008 | 10/11/2008 | 04/12/2011 | $ | 0.18 | 88 | 37Months |
| 215 | 1633820 | GUIDE ASSY | Nos | Foreign | 05/12/2004 | 05/12/2014 | 06/01/2008 | $ | 9.5 | 16 | 37Months |
| 216 | 1633922 | SWITCH PUSH BOTTON. | Nos | Local | 09/06/1991 | 09/06/1991 | 24/07/1994 | $ | 0.87 | 120 | 37Months |
| 217 | 1633922 | SWITCH PUSH BOTTON. | Nos | Foreign | 08/04/2009 | 23/06/2009 | 04/06/2012 | $ | 2.71 | 204 | 38Months |

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| 218 | 1634210 | ELEMENT - FILTER 8-1/2 | Nos | Foreign | 03/04/2006 | 03/04/2006 | 15/06/2009 | $ | 0.12 | 21 | 38Months |
| 219 | 1634210 | ELEMENT - FILTER 8-1/2 | Nos | Foreign | 06/05/2007 | 22/03/2007 | 22/07/2010 | $ | 10.84 | 45 | 38Months |
| 220 | 1634210 | ELEMENT - FILTER 8-1/2 | Nos | Foreign | 15/12/2004 | 04/06/2007 | 06/02/2008 | $ | 64.96 | 12 | 38Months |
| 221 | 1634210 | ELEMENT - FILTER 8-1/2 | Nos | Local | 02/01/2008 | 02/01/2008 | 22/03/2011 | $ | 20.41 | 0 | 38Months |
| 222 | 1634210 | ELEMENT - FILTER 8-1/2 | Nos | Foreign | 14/05/2008 | 28/01/2008 | 10/08/2011 | $ | 0.08 | 70 | 39Months |
| 223 | 1634210 | ELEMENT - FILTER 8-1/2 | Nos | Local | 01/04/1990 | 05/12/1989 | 22/07/1993 | $ | 119.87 | 2 | 39Months |
| 224 | 1634210 | ELEMENT - FILTER 8-1/2 | Nos | Local | 08/12/2007 | 15/01/2008 | 22/03/2011 | $ | 72 | 11 | 39Months |
| 225 | 1634210 | ELEMENT - FILTER 8-1/2 | Nos | Local | 08/12/2007 | 15/01/2008 | 22/03/2011 | $ | 163.66 | 0 | 39Months |
| 226 | 1634210 | ELEMENT - FILTER 8-1/2 | Nos | Local | 01/04/2000 | 01/04/2000 | 26/08/2003 | $ | 3.46 | 148 | 40Months |
| 227 | 1634240 | SEAL - '0' RING | Nos | Local | 22/02/1990 | 22/02/1990 | 18/08/1993 | $ | 15.61 | 2 | 42Months |

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| 228 | 1634240 | SEAL - '0' RING | Nos | Foreign | 15/02/2011 | 06/04/2011 | 25/09/2014 | $ | 687.92 | 2 | 43Months |
| 229 | 1634240 | SEAL - '0' RING | Nos | Local | 29/04/2008 | 14/12/2008 | 24/01/2012 | $ | 39.13 | 150 | 45Months |
| 230 | 1634340 | VALVE | Nos | Local | 29/04/2008 | 29/04/2008 | 24/01/2012 | $ | 39.13 | 150 | 45Months |
| 231 | 1634340 | VALVE | Nos | Local | 30/01/2011 | 30/01/2011 | 02/05/2011 | $ | 189.14 | 3 | 4Months |
| 232 | 1634340 | VALVE | Nos | Foreign | 06/06/1999 | 06/06/1999 | 15/09/2003 | $ | 0.02 | 500 | 51Months |
| 233 | 1634400 | GASKET(SS BY 9572081) | Nos | Local | 12/12/2007 | 15/01/2008 | 10/03/2012 | $ | 4.5 | 82 | 51Months |
| 234 | 1634400 | GASKET(SS BY 9572081) | Nos | Foreign | 02/03/1991 | 02/03/1991 | 18/07/1995 | $ | 18.85 | 0 | 52Months |
| 235 | 1634545 | PLUG (3 POLR MALE) | Nos | Foreign | 10/11/2008 | 07/09/2009 | 02/04/2013 | $ | 29.615 | 24 | 53Months |
| 236 | 1634680 | VOLTAGE REGULATOR. | Nos | Foreign | 31/07/2005 | 12/07/2005 | 14/02/2010 | $ | 554.36 | 1 | 55Months |
| 237 | 1634680 | VOLTAGE REGULATOR. | Nos | Foreign | 29/08/1993 | 29/08/1993 | 22/01/1994 | $ | 37.48 | 1 | 5Months |

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| 238 | 1634680 | VOLTAGE REGULATOR. | Nos | Foreign | 18/08/2008 | 16/06/2008 | 10/02/2009 | $ | 178.71 | 15 | 6Months |
| 239 | 1634680 | VOLTAGE REGULATOR. | Nos | Local | 07/08/2012 | 30/08/2010 | 20/03/2013 | $ | 8.59 | 150 | 7Months |
| 240 | 1634680 | VOLTAGE REGULATOR. | Nos | Foreign | 09/05/1994 | 09/05/1994 | 11/01/1995 | $ | 14.76 | 6 | 8Months |
| 241 | 1634680 | VOLTAGE REGULATOR. | Nos | Foreign | 11/06/1994 | 11/06/1994 | 26/02/1995 | $ | 39 | 15 | 8Months |
| 242 | 1635180 | BOWL - GLASS -OIL SIGHT | Nos | Foreign | 18/05/2009 | 07/09/2009 | 23/01/2012 | $ | 27.19 | 29 | 32Months |
| 243 | 1635180 | BOWL - GLASS -OIL SIGHT | Nos | Local | 17/12/2011 | 08/06/2012 | 29/08/2012 | $ | 401.29 | 5 | 8Months |
| 244 | 1635180 | BOWL - GLASS -OIL SIGHT | Nos | Local | 22/02/2003 | 11/05/2003 | 18/10/2004 | $ | 29.58 | 17 | 20Months |
| 245 | 1635200 | ELEMENT FILTER PAPER | Nos | Foreign | 24/04/2002 | 14/05/2002 | 14/02/2010 | $ | 687.92 | 0 | 94Months |
| 246 | 1635200 | ELEMENT FILTER PAPER | Nos | Local | 06/01/2004 | 18/01/2003 | 12/10/2004 | $ | 1.5 | 88 | 9Months |
| 247 | 1635200 | ELEMENT FILTER PAPER | Nos | Foreign | 08/01/2006 | | | $ | 0.37 | 20 | still not receive |

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| 248 | 1635200 | ELEMENT FILTER PAPER | Nos | Foreign | 27/01/2013 | 10/04/2013 | | $ | 5.4 | 0 | still not receive |
| 249 | 1635200 | ELEMENT FILTER PAPER | Nos | Foreign | 22/04/2015 | 28/05/2015 | | $ | 22.45 | 0 | still not receive |
| 250 | 1635200 | ELEMENT FILTER PAPER | Nos | Foreign | 23/04/1995 | 12/07/1997 | | $ | | 0 | still not receive |
| 251 | 1635200 | ELEMENT FILTER PAPER | Nos | Foreign | 12/09/2013 | 31/10/2013 | | $ | 687.92 | 0 | still not receive |
| 252 | 1635200 | ELEMENT FILTER PAPER | Nos | Foreign | 24/04/2013 | 20/05/2013 | | $ | 0.61 | 0 | still not receive |
| 253 | 1635845 | PLUG (ETS) | Nos | Foreign | 28/02/2013 | 30/12/2012 | | $ | 8.51 | 0 | still not receive |
| 254 | 1635940 | PLUNGER | Nos | Foreign | 05/11/2007 | 28/11/2007 | | $ | 525 | 0 | still not receive |
| 255 | 1635940 | PLUNGER | Nos | Foreign | 20/11/2003 | 04/01/2004 | | $ | 147 | 0 | still not receive |
| 256 | 1635940 | PLUNGER | Nos | Foreign | 24/11/2014 | 23/12/2014 | | $ | 0.48 | 0 | still not receive |
| 257 | 1636260 | BEARING, MAIN . | Nos | Local | 07/09/2009 | 28/07/2009 | | $ | 0.29 | 0 | still not receive |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 258 | 1636490 | NUT,HEX, LOCK, 1/2-20. | Nos | Local | 07/09/2009 | 07/09/2009 | | $ | 0.29 | 0 | still not receive |
| 259 | 1636490 | NUT,HEX, LOCK, 1/2-20. | Nos | Local | 22/11/2012 | 22/09/2012 | | $ | 18.65 | 0 | still not receive |
| 260 | 1636490 | NUT,HEX, LOCK, 1/2-20. | Nos | Local | 02/06/2014 | 17/09/2014 | | $ | 4.98 | | still not receive |
| 261 | 1636490 | NUT,HEX, LOCK, 1/2-20. | Nos | Local | 27/01/2013 | 14/04/2013 | | $ | 80.41 | 0 | still not receive |
| 262 | 1636560 | BEARING | Nos | Local | 28/03/2012 | 16/04/2012 | | $ | 72 | 0 | still not receive |
| 263 | 1636560 | BEARING | Nos | Local | 15/11/2011 | 24/11/2011 | | $ | 397.5 | 0 | still not receive |
| 264 | 1636560 | BEARING | Nos | Local | 28/06/2003 | 28/08/2001 | | $ | 249.58 | 48 | still not receive |
| 265 | 1636650 | BEARING | Nos | Foreign | 05/07/2005 | 03/07/2005 | 16/07/2005 | Taka | 22080 | 20 | 0Months |
| 266 | 1636650 | BEARING | Nos | Foreign | 15/01/1992 | 18/09/1990 | 16/01/1992 | Taka | 1658 | 12 | 0Months |
| 267 | 1636650 | BEARING | Nos | Foreign | 11/04/2009 | 22/01/2009 | 29/04/2009 | Taka | 2525 | 43 | 0Months |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 268 | 1636650 | BEARING | Nos | Foreign | 07/10/2004 | 21/08/2004 | 28/10/2004 | Taka | 12288 | 77 | 0Months |
| 269 | 1636650 | BEARING | Nos | Local | 02/09/2014 | 09/08/2014 | 30/09/2014 | Taka | 1450 | 657 | 0Months |
| 270 | 1636650 | BEARING | Pair | Local | 08/12/2012 | 10/06/2012 | 12/12/2012 | Taka | 25380 | 21 | 0Months |
| 271 | 1636760 | SEAL | Nos | Local | 29/08/2012 | 26/02/2012 | 04/08/2012 | Taka | 3725 | 80 | 0Months |
| 272 | 1636760 | SEAL | Nos | Foreign | 29/10/2006 | 08/07/2006 | 22/08/2007 | Taka | 4649 | 52 | 10Months |
| 273 | 1636760 | SEAL | Nos | Foreign | 31/03/1998 | 31/03/1998 | 05/01/1999 | Taka | 1550 | 22 | 10Months |
| 274 | 1637360 | KIT - SEAL | Nos | Foreign | 27/11/2007 | 24/10/2007 | 07/09/2008 | Taka | 182 | 34 | 10Months |
| 275 | 1637360 | KIT - SEAL | Nos | Foreign | 22/11/2007 | 24/10/2007 | 07/09/2008 | Taka | 254 | 28 | 10Months |
| 276 | 1637360 | KIT - SEAL | Nos | Foreign | 06/01/1998 | 31/03/1998 | 17/11/1998 | Taka | 5000 | 24 | 10Months |
| 277 | 1637360 | KIT - SEAL | Nos | Foreign | 10/05/2005 | 16/07/2005 | 19/03/2006 | Taka | 39 | 66 | 10Months |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 278 | 1637360 | KIT - SEAL | Nos | Foreign | 12/06/2007 | 08/07/2007 | 19/04/2008 | Taka | 3325 | 0 | 10Months |
| 279 | 1637360 | KIT - SEAL | Nos | Local | 01/11/2012 | 30/07/2012 | 07/09/2013 | Taka | 5800 | 147 | 10Months |
| 280 | 1637500 | CORE GASKET | Nos | Foreign | 01/08/2013 | 17/07/2013 | 07/07/2014 | Taka | 5550 | 241 | 11Months |
| 281 | 1637740 | WASHER | Nos | Foreign | 11/04/2007 | 24/09/2007 | 10/03/2008 | Taka | 108 | 201 | 11Months |
| 282 | 1637740 | WASHER | Pair | Local | 27/04/2010 | 11/08/2009 | 15/03/2011 | Taka | 23798 | 50 | 11Months |
| 283 | 1637740 | WASHER | Nos | Foreign | 25/09/2013 | 26/08/2013 | 17/09/2014 | Taka | 29000 | 27 | 12Months |
| 284 | 1637810 | WASHER | Nos | Foreign | 11/06/2008 | 17/05/2008 | 08/06/2009 | Taka | 187 | 18 | 12Months |
| 285 | 1637810 | WASHER | Nos | Foreign | 24/10/2011 | 12/10/2011 | 01/10/2012 | Taka | 126 | 102 | 12Months |
| 286 | 1637810 | WASHER | Nos | Foreign | 11/10/2012 | 02/09/2012 | 09/10/2013 | Taka | 140 | 60 | 12Months |
| 287 | 1637810 | WASHER | Nos | Local | 24/09/2007 | 22/09/2007 | 02/09/2008 | Taka | 252 | 252 | 12Months |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 288 | 1638150 | BOLT | Nos | Foreign | 07/02/2004 | 19/08/2004 | 02/03/2005 | Taka | 200 | 509 | 13Months |
| 289 | 1638700 | BASIC REPAIR | Nos | Foreign | 03/05/2009 | 18/12/2008 | 11/07/2010 | Taka | 182 | 39 | 14Months |
| 290 | 1638700 | BASIC REPAIR | Nos | Foreign | 23/06/2003 | 20/04/2003 | 21/08/2004 | Taka | 254 | 67 | 14Months |
| 291 | 1638700 | BASIC REPAIR | Nos | Foreign | 19/09/2007 | 19/08/2007 | 10/11/2008 | Taka | 115 | 37 | 14Months |
| 292 | 1638700 | BASIC REPAIR | Nos | Local | 23/04/2013 | 06/03/2013 | 18/06/2014 | Taka | 5500 | 101 | 14Months |
| 293 | 1639500 | NUT, LOCK, 1-8 | Nos | Foreign | 03/04/2007 | 07/02/2007 | 23/08/2008 | Taka | 126 | 127 | 16Months |
| 294 | 1639500 | NUT, LOCK, 1-8 | Nos | Foreign | 01/06/2011 | 10/05/2011 | 01/10/2012 | Taka | 20800 | 23 | 16Months |
| 295 | 1642170 | BEARING - SHELL - | Nos | Foreign | 25/04/2013 | 10/04/2013 | 22/09/2014 | Taka | 2675 | 10 | 17Months |
| 296 | 1642550 | GASKET AIR BOX & OIL | Nos | Foreign | 10/04/2013 | 02/03/2013 | 07/09/2014 | Taka | 130 | 51 | 17Months |
| 297 | 1642550 | GASKET AIR BOX & OIL | Nos | Foreign | 18/12/2008 | 24/11/2008 | 08/06/2010 | Taka | 128 | 69 | 18Months |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 298 | 1642550 | GASKET AIR BOX & OIL | Nos | Foreign | 01/08/2013 | 19/06/2013 | 14/02/2015 | Taka | 175 | 10 | 18Months |
| 299 | 1642550 | GASKET AIR BOX & OIL | Nos | Foreign | 21/09/2005 | 12/06/2005 | 12/04/2007 | Taka | 280 | 39 | 19Months |
| 300 | 1643030 | GEAR PINION 16 TEETH | Nos | Foreign | 12/01/2005 | 10/11/2016 | 19/02/2005 | Taka | 22080 | 20 | 1Months |
| 301 | 1643030 | GEAR PINION 16 TEETH | Nos | Foreign | 19/02/2012 | 11/10/2011 | 28/03/2012 | Taka | 5750 | 159 | 1Months |
| 302 | 1643030 | GEAR PINION 16 TEETH | Nos | Foreign | 09/10/2004 | 21/09/2004 | 29/11/2004 | Taka | 4649 | 91 | 1Months |
| 303 | 1643030 | GEAR PINION 16 TEETH | Nos | Foreign | 12/02/2005 | 12/02/2005 | 15/03/2005 | Taka | 4649 | 46 | 1Months |
| 304 | 1643080 | ELEMENT FILTER PLEATED | Nos | Foreign | 18/04/2006 | 06/03/2006 | 22/05/2006 | Taka | 4649 | 71 | 1Months |
| 305 | 1643080 | ELEMENT FILTER PLEATED | Nos | Foreign | 16/05/2010 | 16/11/2009 | 01/06/2010 | Taka | 5200 | 400 | 1Months |
| 306 | 1643080 | ELEMENT FILTER PLEATED | Nos | Foreign | 07/05/1996 | 10/04/1996 | 23/06/1996 | Taka | 1658 | 32 | 1Months |
| 307 | 1643080 | ELEMENT FILTER PLEATED | Nos | Foreign | 31/08/2014 | 23/04/2014 | 17/09/2014 | Taka | 29000 | 42 | 1Months |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 308 | 1643080 | ELEMENT FILTER PLEATED | Nos | Foreign | 19/01/2004 | | 24/02/2004 | Taka | 85 | 49 | 1Months |
| 309 | 1643080 | ELEMENT FILTER PLEATED | Nos | Local | 14/07/2015 | 13/07/2015 | 30/08/2015 | Taka | 1480 | 1870 | 1Months |
| 310 | 1643080 | ELEMENT FILTER PLEATED | Nos | Local | 04/02/2016 | 25/01/2016 | 16/03/2016 | Taka | 1480 | 783 | 1Months |
| 311 | 1643660 | DUCT ASSY, TRUCTION MOTOR | Nos | Local | 18/04/2016 | 27/02/2016 | 03/05/2016 | Taka | 394 | 1480 | 1Months |
| 312 | 1643660 | DUCT ASSY, TRUCTION MOTOR | Nos | Local | 12/12/2011 | 26/07/2011 | 07/01/2012 | Taka | 82100 | 2 | 1Months |
| 313 | 1643660 | DUCT ASSY, TRUCTION MOTOR | Nos | Local | 16/07/2005 | 10/07/2005 | 15/08/2005 | Taka | 3325 | 200 | 1Months |
| 314 | 1643660 | DUCT ASSY, TRUCTION MOTOR | Nos | Local | 18/02/2012 | 01/06/2011 | 06/03/2012 | Taka | 3617 | 67 | 1Months |
| 315 | 1643660 | DUCT ASSY, TRUCTION MOTOR | Nos | Local | 18/02/2012 | 16/06/2011 | 06/03/2012 | Taka | 4496 | 67 | 1Months |
| 316 | 1643660 | DUCT ASSY, TRUCTION MOTOR | Nos | Foreign | 17/09/2007 | 22/11/2007 | 14/06/2009 | Taka | 3325 | 0 | 21Months |
| 317 | 1643660 | DUCT ASSY, TRUCTION MOTOR | Nos | Foreign | 24/12/1989 | 24/12/1989 | 05/01/1992 | Taka | 354.34 | 0 | 25Months |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 318 | 1643660 | DUCT ASSY, TRUCTION MOTOR | Nos | Foreign | 03/03/2008 | 10/02/2008 | 11/07/2010 | Taka | 182 | 11 | 28Months |
| 319 | 1643660 | DUCT ASSY, TRUCTION MOTOR | Nos | Foreign | 08/01/2008 | 30/12/2007 | 25/03/2008 | Taka | 25900 | 5 | 2Months |
| 320 | 1643660 | DUCT ASSY, TRUCTION MOTOR | Nos | Foreign | 06/08/2014 | 05/08/2014 | 26/10/2014 | Taka | 950 | 128 | 2Months |
| 321 | 1643660 | DUCT ASSY, TRUCTION MOTOR | Nos | Foreign | 31/03/1997 | 19/03/1997 | 05/05/1997 | Taka | 1658 | 24 | 2Months |
| 322 | 1643660 | DUCT ASSY, TRUCTION MOTOR | Nos | Foreign | 02/06/2002 | 28/05/2002 | 18/08/2002 | Taka | 392 | 216 | 2Months |
| 323 | 1644030 | CARBON BRUSH | Nos | Foreign | 10/07/2008 | 09/07/2008 | 15/09/2008 | Taka | 2528 | 42 | 2Months |
| 324 | 1644030 | CARBON BRUSH | Nos | Foreign | 28/06/2015 | 10/06/2015 | 22/08/2015 | Taka | 2500 | 51 | 2Months |
| 325 | 1645542 | ADAPTOR ASSY. | Nos | Foreign | 14/03/2006 | 01/03/2006 | 25/05/2006 | Taka | 14000 | 66 | 2Months |
| 326 | 1645542 | ADAPTOR ASSY. | Nos | Foreign | 11/02/2015 | 17/02/2015 | 06/04/2015 | Taka | 29000 | 47 | 2Months |
| 327 | 1645542 | ADAPTOR ASSY. | Nos | Foreign | 28/09/2015 | 17/08/2015 | 02/11/2015 | Taka | 29000 | 44 | 2Months |

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| 328 | 1645542 | ADAPTOR ASSY. | Nos | Foreign | 08/11/2015 | 13/10/2015 | 12/01/2016 | Taka | 130 | 300 | 2Months |
| 329 | 1645565 | ADAPTOR BOX (IDLER) | Nos | Foreign | 29/07/2003 | 15/06/2003 | 21/09/2003 | Taka | 85 | 23 | 2Months |
| 330 | 1645565 | ADAPTOR BOX (IDLER) | Nos | Local | 02/09/2014 | 09/08/2014 | 03/11/2014 | Taka | 1450 | 192 | 2Months |
| 331 | 1645950 | SEAL | Pair | Local | 24/04/2015 | 29/07/2015 | 22/06/2015 | Taka | 27400 | 24 | 2Months |
| 332 | 1645950 | SEAL | Nos | Local | 02/04/2013 | 30/03/2013 | 12/06/2013 | Taka | 6410 | 25 | 2Months |
| 333 | 1645950 | SEAL | Nos | Foreign | 04/02/2012 | 08/12/2012 | 26/10/2014 | Taka | 10600 | 2 | 32Months |
| 334 | 1645960 | SEAL | Nos | Local | 06/01/2004 | 22/02/2004 | 18/09/2006 | Taka | 15855.98 | 52 | 32Months |
| 335 | 1645970 | GASKET KIT. | Nos | Local | 23/11/2011 | 04/10/2011 | 25/09/2014 | Taka | 8240.65 | 3 | 34Months |
| 336 | 1645970 | GASKET KIT. | Nos | Foreign | 31/07/2012 | 19/02/2012 | 21/10/2012 | Taka | 7200 | 147 | 3Months |
| 337 | 1645970 | GASKET KIT. | Nos | Foreign | 15/01/2012 | 15/01/2012 | 02/04/2012 | Taka | 880 | 250 | 3Months |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 338 | 1645970 | GASKET KIT. | Nos | Foreign | 08/01/2008 | 31/12/2007 | 15/04/2008 | Taka | 2515 | 66 | 3Months |
| 339 | 1645970 | GASKET KIT. | Nos | Foreign | 12/02/2013 | 06/01/2013 | 27/05/2013 | Taka | 20800 | 34 | 3Months |
| 340 | 1645970 | GASKET KIT. | Nos | Foreign | 20/08/2001 | 14/03/2001 | 08/11/2001 | Taka | 255 | 26 | 3Months |
| 341 | 1645970 | GASKET KIT. | Nos | Foreign | 14/03/2001 | 30/01/2001 | 11/06/2001 | Taka | 255 | 26 | 3Months |
| 342 | 1645980 | MODULE | Nos | Foreign | 15/06/2003 | 23/06/2003 | 21/09/2003 | Taka | 85 | 44 | 3Months |
| 343 | 1646100 | BEARING AXLE | Nos | Foreign | 08/01/2005 | 25/11/2004 | 05/04/2005 | Taka | 92 | 78 | 3Months |
| 344 | 1646100 | BEARING AXLE | Nos | Local | 06/01/2014 | 12/11/2013 | 22/04/2014 | Taka | 1450 | 794 | 3Months |
| 345 | 1646100 | BEARING AXLE | Nos | Local | 13/05/2004 | 12/05/2004 | 21/08/2004 | Taka | 650 | 350 | 3Months |
| 346 | 1646100 | BEARING AXLE | Pair | Local | 05/09/2012 | 05/09/2012 | 12/12/2012 | Taka | 25000 | 8 | 3Months |
| 347 | 1646100 | BEARING AXLE | Nos | Local | 10/09/2012 | 10/09/2012 | 12/12/2012 | Taka | 4676 | 84 | 3Months |

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| 348 | 1646100 | BEARING AXLE | Nos | Local | 02/04/2013 | 30/03/2013 | 22/07/2013 | Taka | 4816 | 55 | 3Months |
| 349 | 1646100 | BEARING AXLE | Nos | Local | 11/11/2015 | 29/10/2015 | 11/02/2016 | Taka | 5550 | 83 | 3Months |
| 350 | 1646100 | BEARING AXLE | Nos | Local | 21/09/2015 | 07/07/2015 | 14/12/2015 | Taka | 6550 | 57 | 3Months |
| 351 | 1646100 | BEARING AXLE | Nos | Local | 12/02/2013 | 23/01/2013 | 29/05/2013 | Taka | 6410 | 22 | 3Months |
| 352 | 1646100 | BEARING AXLE | Nos | Local | 04/10/2012 | 29/09/2012 | 15/01/2013 | Taka | 6410 | 33 | 3Months |
| 353 | 1646308 | BEARING BALL. | Nos | Local | 20/09/2015 | 25/08/2015 | 05/12/2015 | Taka | 990 | 505 | 3Months |
| 354 | 1646308 | BEARING BALL. | Nos | Local | 14/03/2003 | 30/01/2003 | 10/04/2007 | Taka | 81315 | 3 | 49Months |
| 355 | 1646770 | SEAL - LOWER LINER - | Nos | Local | 19/03/2003 | 30/01/2003 | 10/04/2007 | Taka | 81315 | 3 | 49Months |
| 356 | 1646770 | SEAL - LOWER LINER - | Nos | Foreign | 14/03/2013 | 12/03/2013 | 04/07/2013 | Taka | 925 | 140 | 4Months |
| 357 | 1646770 | SEAL - LOWER LINER - | Nos | Foreign | 07/03/2015 | 02/03/2015 | 14/07/2015 | Taka | 950 | 135 | 4Months |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 358 | 1647085 | ELEMENT - RECTANGULAR | Nos | Foreign | 19/11/2014 | 10/11/2014 | 01/03/2015 | Taka | 3390 | 7 | 4Months |
| 359 | 1647085 | ELEMENT - RECTANGULAR | Nos | Foreign | 01/06/2010 | 01/06/2010 | 26/10/2010 | Taka | 202 | 1586 | 4Months |
| 360 | 1647085 | ELEMENT - RECTANGULAR | Nos | Foreign | 25/11/2014 | 18/11/2014 | 07/03/2015 | Taka | 2500 | 73 | 4Months |
| 361 | 1647085 | ELEMENT - RECTANGULAR | Nos | Foreign | 16/04/2009 | 11/04/2009 | 09/08/2009 | Taka | 2525 | 45 | 4Months |
| 362 | 1647085 | ELEMENT - RECTANGULAR | Nos | Foreign | 29/07/2012 | 14/07/2012 | 28/11/2012 | Taka | 20800 | 20 | 4Months |
| 363 | 1647085 | ELEMENT - RECTANGULAR | Nos | Foreign | 19/07/2005 | 19/06/2005 | 21/11/2005 | Taka | 14000 | 33 | 4Months |
| 364 | 1647085 | ELEMENT - RECTANGULAR | Nos | Foreign | 21/01/2015 | 28/12/2014 | 05/05/2015 | Taka | 130 | 168 | 4Months |
| 365 | 1647085 | ELEMENT - RECTANGULAR | Nos | Foreign | 10/07/2005 | 22/08/2005 | 23/11/2005 | Taka | 97 | 36 | 4Months |
| 366 | 1647085 | ELEMENT - RECTANGULAR | Nos | Local | 26/09/2007 | 15/12/2004 | 23/01/2008 | Taka | 0.04 | 347 | 4Months |
| 367 | 1647085 | ELEMENT - RECTANGULAR | Nos | Local | 14/01/2009 | 11/01/2009 | 05/05/2009 | Taka | 81315 | 5 | 4Months |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 368 | 1647085 | ELEMENT - RECTANGULAR | Nos | Local | 19/02/2012 | 12/02/2012 | 03/06/2012 | Taka | 82100 | 6 | 4Months |
| 369 | 1647085 | ELEMENT - RECTANGULAR | Nos | Local | 12/06/2007 | 04/06/2007 | 24/10/2007 | Taka | 87315 | 4 | 4Months |
| 370 | 1647085 | ELEMENT - RECTANGULAR | Nos | Local | 12/06/2007 | 04/06/2007 | 24/10/2007 | Taka | 87315 | 4 | 4Months |
| 371 | 1647085 | ELEMENT - RECTANGULAR | Nos | Local | 13/01/2010 | 09/01/2010 | 03/05/2010 | Taka | 81315 | 2 | 4Months |
| 372 | 1647085 | ELEMENT - RECTANGULAR | Nos | Local | 13/06/2010 | 16/05/2010 | 18/10/2010 | Taka | 768 | 625 | 4Months |
| 373 | 1647085 | ELEMENT - RECTANGULAR | Pair | Local | 14/02/2012 | 11/12/2011 | 09/06/2012 | Taka | 24490 | 54 | 4Months |
| 374 | 1647085 | ELEMENT - RECTANGULAR | Pair | Local | 20/05/2014 | 20/05/2014 | 07/09/2014 | Taka | 27400 | 45 | 4Months |
| 375 | 1647105 | SPRING DOUBLE COIL | Pair | Local | 23/02/2016 | 03/02/2016 | 07/06/2016 | Taka | 30380 | 65 | 4Months |
| 376 | 1647105 | SPRING DOUBLE COIL | Pair | Local | 01/08/2013 | 01/08/2013 | 22/12/2013 | Taka | 26500 | 32 | 4Months |
| 377 | 1647105 | SPRING DOUBLE COIL | Nos | Local | 11/11/2015 | 04/11/2015 | 28/03/2016 | Taka | 5350 | 78 | 4Months |

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| 378 | 1647270 | PUMP ASSEMBLY - WATER | Nos | Local | 03/10/2011 | 19/09/2011 | 07/02/2012 | Taka | 5080 | 129 | 4Months |
| 379 | 1647270 | PUMP ASSEMBLY - WATER | Nos | Local | 03/03/2013 | 02/04/2013 | 22/07/2013 | Taka | 3951 | 58 | 4Months |
| 380 | 1647425 | STRAINER - OIL PUMP INLET | Nos | Local | 21/05/2014 | 14/08/2016 | 16/09/2014 | Taka | 5125 | 42 | 4Months |
| 381 | 1647425 | STRAINER - OIL PUMP INLET | Nos | Local | 24/11/2011 | 21/11/2011 | 06/03/2012 | Taka | 6220 | 37 | 4Months |
| 382 | 1647525 | GASKET | Nos | Local | 28/05/2012 | 14/05/2012 | 05/09/2012 | Taka | 6310 | 36 | 4Months |
| 383 | 1647525 | GASKET | Nos | Local | 03/06/2009 | 27/05/2009 | 10/10/2009 | Taka | 5950 | 19 | 4Months |
| 384 | 1647525 | GASKET | Nos | Local | 14/11/2012 | 10/11/2012 | 03/03/2013 | Taka | 6410 | 23 | 4Months |
| 385 | 1647580 | SEAL INNER | Nos | Local | 20/06/2010 | 12/06/2010 | 16/10/2010 | Taka | 6045 | 32 | 4Months |
| 386 | 1647580 | SEAL INNER | Nos | Foreign | 14/10/2014 | 16/09/2014 | 15/03/2015 | Taka | 5550 | 231 | 5Months |
| 387 | 1647580 | SEAL INNER | Nos | Foreign | 31/10/2009 | 07/09/2009 | 01/03/2010 | Taka | 5200 | 68 | 5Months |

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| 388 | 1647580 | SEAL INNER | Nos | Foreign | 05/12/2007 | 04/12/2007 | 20/05/2008 | Taka | 2610 | 108 | 5Months |
| 389 | 1647580 | SEAL INNER | Nos | Foreign | 31/05/1995 | 12/01/1995 | 15/10/1995 | Taka | 1658 | 27 | 5Months |
| 390 | 1647580 | SEAL INNER | Nos | Foreign | 14/09/2005 | 09/07/2005 | 05/02/2006 | Taka | 100 | 108 | 5Months |
| 391 | 1647590 | SEAL OUTER | Nos | Foreign | 18/04/2006 | 05/04/2006 | 27/09/2006 | Taka | 105 | 66 | 5Months |
| 392 | 1647590 | SEAL OUTER | Nos | Foreign | 23/03/2014 | 02/03/2014 | 13/08/2014 | Taka | 2545 | 89 | 5Months |
| 393 | 1647590 | SEAL OUTER | Nos | Foreign | 20/08/2015 | 04/07/2015 | 12/01/2016 | Taka | 130 | 75 | 5Months |
| 394 | 1647590 | SEAL OUTER | Nos | Local | 22/12/2009 | 13/12/2009 | 03/05/2010 | Taka | 81315 | 2 | 5Months |
| 395 | 1647590 | SEAL OUTER | Pair | Local | 14/02/2012 | 14/02/2012 | 21/07/2012 | Taka | 24900 | 17 | 5Months |
| 396 | 1647590 | SEAL OUTER | Pair | Local | 02/02/2013 | 12/02/2013 | 15/07/2013 | Taka | 26500 | 21 | 5Months |
| 397 | 1647590 | SEAL OUTER | Nos | Local | 06/04/2006 | 03/03/2006 | 27/09/2006 | Taka | 3650 | 200 | 5Months |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 398 | 1647590 | SEAL OUTER | Nos | Local | 01/06/2011 | 11/05/2011 | 30/11/2011 | Taka | 4930 | 91 | 5Months |
| 399 | 1647654 | PEDESTAL WEAR PLATES | Nos | Local | 21/12/2014 | | 04/05/2015 | Taka | 4500 | 69 | 5Months |
| 400 | 1647654 | PEDESTAL WEAR PLATES | Nos | Local | 18/12/2014 | 28/10/2014 | 04/05/2015 | Taka | 5280 | 89 | 5Months |
| 401 | 1647654 | PEDESTAL WEAR PLATES | Nos | Local | 16/08/2011 | 07/08/2011 | 28/01/2012 | Taka | 6200 | 21 | 5Months |
| 402 | 1647654 | PEDESTAL WEAR PLATES | Nos | Local | 31/01/2011 | 22/01/2011 | 11/06/2011 | Taka | 6105 | 28 | 5Months |
| 403 | 1647654 | PEDESTAL WEAR PLATES | Nos | Foreign | 01/10/2012 | 31/07/2012 | 16/04/2013 | Taka | 7350 | 191 | 6Months |
| 404 | 1647654 | PEDESTAL WEAR PLATES | Nos | Foreign | 29/06/2015 | 10/06/2015 | 29/12/2015 | Taka | 5300 | 198 | 6Months |
| 405 | 1647654 | PEDESTAL WEAR PLATES | Nos | Foreign | 31/12/2008 | 19/04/2008 | 14/06/2009 | Taka | 5180 | 58 | 6Months |
| 406 | 1647654 | PEDESTAL WEAR PLATES | Nos | Foreign | 05/09/2005 | 19/07/2005 | 12/03/2006 | Taka | 14000 | 33 | 6Months |
| 407 | 1647654 | PEDESTAL WEAR PLATES | Nos | Local | 30/07/2012 | 19/04/2012 | 09/01/2013 | Taka | 5800 | 105 | 6Months |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 408 | 1647654 | PEDESTAL WEAR PLATES | Nos | Local | 07/09/2009 | 30/07/2009 | 01/03/2010 | Taka | 4375 | 182 | 6Months |
| 409 | 1647654 | PEDESTAL WEAR PLATES | Nos | Local | 17/05/2009 | 01/02/2009 | 03/11/2009 | Taka | 4375 | 17 | 6Months |
| 410 | 1647654 | PEDESTAL WEAR PLATES | Nos | Local | 31/12/2008 | 11/06/2008 | 14/06/2009 | Taka | 4355 | 101 | 6Months |
| 411 | 1647695 | GASKET - INNER COVER | Nos | Local | 26/02/2012 | 18/02/2012 | 04/08/2012 | Taka | 4585 | 74 | 6Months |
| 412 | 1647695 | GASKET - INNER COVER | Nos | Foreign | 19/03/1991 | 24/11/1996 | 01/03/1997 | Taka | 1658 | 17 | 72Months |
| 413 | 1647830 | GASKET KIT, WATER PUMP. | Nos | Foreign | 29/10/2015 | 13/10/2015 | 15/05/2016 | Taka | 5300 | 293 | 7Months |
| 414 | 1647910 | GASKET - CYLINDER HEAD | Nos | Foreign | 30/04/2008 | 24/04/2008 | 08/11/2008 | Taka | 1997 | 16 | 7Months |
| 415 | 1647915 | GASKET - OIL RELIEF | Nos | Foreign | 19/05/2010 | 19/05/2010 | 30/12/2010 | Taka | 128 | 732 | 7Months |
| 416 | 1647915 | GASKET - OIL RELIEF | Nos | Foreign | 18/11/2009 | 18/10/2009 | 08/06/2010 | Taka | 128 | 99 | 7Months |
| 417 | 1647915 | GASKET - OIL RELIEF | Nos | Foreign | 27/06/2010 | 27/04/2010 | 10/01/2011 | Taka | 509 | 819 | 7Months |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 418 | 1647915 | GASKET - OIL RELIEF | Nos | Foreign | 10/05/2011 | 08/03/2011 | 12/12/2011 | Taka | 20800 | 17 | 7Months |
| 419 | 1647915 | GASKET - OIL RELIEF | Nos | Foreign | 13/07/2010 | 17/05/2010 | 07/02/2011 | Taka | 10120 | 2 | 7Months |
| 420 | 1647922 | PISTON BAR STD. | Nos | Local | 26/01/2011 | 27/06/2010 | 09/08/2011 | Taka | 82100 | 4 | 7Months |
| 421 | 1647922 | PISTON BAR STD | Nos | Local | 01/06/2010 | 16/05/2010 | 17/01/2011 | Taka | 4490 | 270 | 7Months |
| 422 | 1647922 | PISTON BAR STD | Nos | Local | 16/11/2009 | 15/10/2009 | 01/06/2010 | Taka | 4420 | 270 | 7Months |
| 423 | 1647922 | PISTON BAR STD | Nos | Local | 16/11/2009 | 15/10/2009 | 01/06/2010 | Taka | 4420 | 59 | 7Months |
| 424 | 1647922 | PISTON BAR STD | Nos | Local | 04/08/2008 | 07/08/2008 | 09/03/2009 | Taka | 500 | 96 | 7Months |
| 425 | 1647929 | SEAL ASSY | Nos | Foreign | 17/03/2009 | 31/01/2009 | 03/11/2009 | Taka | 5200 | 80 | 8Months |
| 426 | 1647929 | SEAL ASSY | Nos | Foreign | 18/07/2007 | 18/06/2007 | 12/03/2008 | Taka | 55 | 113 | 8Months |
| 427 | 1647929 | SEAL ASSY | Nos | Foreign | 22/04/2009 | 11/04/2009 | 13/12/2009 | Taka | 120 | 480 | 8Months |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 428 | 1647929 | SEAL ASSY | Nos | Local | 01/08/2013 | 06/06/2013 | 21/04/2014 | Taka | 1450 | 771 | 8Months |
| 429 | 1647929 | SEAL ASSY | Nos | Local | 27/06/2010 | 12/06/2010 | 05/02/2011 | Taka | 81315 | 2 | 8Months |
| 430 | 1647990 | KIT | Nos | Local | 17/02/2010 | 13/02/2010 | 02/10/2010 | Taka | 81315 | 2 | 8Months |
| 431 | 1648305 | LOCKING PLATE | Nos | Local | 22/03/2007 | 07/02/2007 | 04/11/2007 | Taka | 3890 | 180 | 8Months |
| 432 | 1648305 | LOCKING PLATE | Nos | Foreign | 25/09/2007 | 22/09/2007 | 10/06/2008 | Taka | 5080 | 172 | 9Months |
| 433 | 1656117 | KIT, BASIC REPAIR | Nos | Foreign | 30/04/2007 | 24/04/2007 | 29/01/2008 | Taka | 1997 | 48 | 9Months |
| 434 | 1656117 | KIT, BASIC REPAIR | Nos | Foreign | 12/01/2010 | 14/11/2009 | 28/10/2010 | Taka | 187 | 500 | 9Months |
| 435 | 1656118 | KIT REPAIR INJECTOR | Nos | Foreign | 31/03/1997 | 17/07/1997 | 30/12/1997 | Taka | 534 | 22 | 9Months |
| 436 | 1656118 | KIT REPAIR INJECTOR | Nos | Foreign | 25/09/2007 | 22/09/2007 | 26/06/2008 | Taka | 103 | 500 | 9Months |
| 437 | 1656118 | KIT REPAIR INJECTOR | Nos | Local | 11/06/2008 | 11/05/2008 | 09/03/2009 | Taka | 4355 | 18 | 9Months |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 438 | 1670925 | PUMP, FUEL | Nos | Local | 04/11/2013 | 03/09/2013 | 25/08/2014 | Taka | 4300 | 53 | 9Months |
| 439 | 1670925 | PUMP, FUEL | Nos | Local | 03/03/2012 | 10/09/2012 | 19/12/2012 | Taka | 3836 | 71 | 9Months |
| 440 | 1670925 | PUMP, FUEL | Nos | Local | 04/11/2013 | 03/09/2013 | 25/08/2014 | Taka | 5125 | 53 | 9Months |
| 441 | 1670925 | PUMP, FUEL | Nos | Local | 17/01/2005 | 11/03/2005 | 24/10/2005 | Taka | 5609 | 24 | 9Months |
| 442 | 1671455 | BOLT 1-8X5 1/2 | Nos | Foreign | 14/04/2004 | 11/04/2004 | 21/09/2003 | Taka | 4649 | 44 | still not receive |
| 443 | 1671455 | BOLT 1-8X5 1/2 | Nos | Foreign | 03/10/2011 | 01/06/2010 | 17/01/2011 | Taka | 5300 | 376 | still not receive |
| 444 | 1671455 | BOLT 1-8X5 1/2 | Nos | Foreign | 05/08/2014 | 26/11/2013 | | Taka | 925 | 172 | still not receive |
| 445 | 1671455 | BOLT 1-8X5 1/2 | Nos | Foreign | 02/03/2015 | 15/02/2015 | | Taka | 3390 | | still not receive |
| 446 | 1671455 | BOLT 1-8X5 1/2 | Nos | Foreign | 17/05/2010 | 27/04/2010 | | Taka | 320 | 636 | still not receive |
| 447 | 1671785 | RING-PISTON -LP | Nos | Foreign | 30/12/2001 | 01/01/2002 | | Taka | 97000 | 0 | still not receive |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 448 | 1671785 | RING-PISTON -LP | Nos | Local | 25/07/2011 | 07/08/2011 | | Taka | 1739 | 0 | still not receive |
| 449 | 1671785 | RING-PISTON -LP | Nos | Local | 12/11/1996 | 12/11/1996 | 28/01/1999 | Taka | 14.88 | 6 | 26Months |
| 450 | 1671785 | RING-PISTON -LP | Nos | Foreign | 23/07/2006 | 11/10/2006 | 01/03/2009 | $ | | 0 | 32Months |
| 451 | 1671995 | KIT AXLE GUARD | Nos | Foreign | 22/01/2013 | 17/04/2013 | | $ | | 0 | still not receive |
| 452 | 1676010 | PISTON BAR STD | Nos | Foreign | 30/08/2014 | 22/10/2014 | | $ | | 0 | still not receive |
| 453 | 1676010 | PISTON BAR STD | Nos | Foreign | 22/02/2009 | 29/04/2009 | | $ | | 0 | still not receive |
| 454 | 1676010 | PISTON BAR STD | Nos | Foreign | 23/06/2012 | 19/07/2012 | | $ | | 0 | still not receive |
| 455 | 1679070 | WASHER | Nos | Local | 06/01/2014 | 13/03/2014 | | Taka | | 0 | still not receive |
| 456 | 1679070 | WASHER | Nos | Local | 20/05/2014 | 22/07/2014 | | Taka | | 0 | still not receive |
| 457 | 1679070 | WASHER | Nos | Local | 20/10/2011 | 23/11/2011 | | Taka | | 0 | still not receive |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 458 | 1679070 | WASHER | Nos | Local | 31/07/2012 | 12/08/2012 | | Taka | | 0 | still not receive |
| 459 | 1689270 | BEARING - CRANKPIN | Nos | Local | 17/05/2010 | 13/07/2010 | | Taka | | 0 | still not receive |
| 460 | 1689270 | BEARING - CRANKPIN | Nos | Local | 09/08/2014 | 17/09/2014 | | Taka | | 0 | still not receive |
| 461 | 1689270 | BEARING - CRANKPIN | Nos | Local | 15/11/2014 | 04/12/2014 | | Taka | | 0 | still not receive |
| 462 | 1689270 | BEARING - CRANKPIN | Nos | Local | 09/08/2014 | 17/09/2014 | | Taka | | 0 | still not receive |
| 463 | 1689270 | BEARING - CRANKPIN | Nos | Local | 11/11/2010 | 25/09/2010 | | Taka | 9.28 | 0 | still not receive |
| 464 | 1695790 | RING,COMP. TAPER | Nos | Foreign | 11/08/2009 | 13/01/2009 | 27/06/2010 | $ | 6.58 | 16 | 10Months |
| 465 | 1695920 | GASKET, POWER ASSY | Nos | Foreign | 20/03/2006 | 05/05/2005 | 22/01/2007 | $ | 4.35 | 38 | 10Months |
| 466 | 1695920 | GASKET, POWER ASSY | Nos | Local | 07/10/2002 | 07/10/2002 | 18/08/2003 | $ | 302.8 | 0 | 10Months |
| 467 | 1695920 | GASKET, POWER ASSY | Nos | Local | 15/05/2011 | 24/02/2010 | 24/04/2012 | $ | 2.94 | 200 | 11Months |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 468 | 7297690 | INSERT NEUTRAL,30MM | Nos | Local | 27/01/2009 | 04/06/2008 | 15/12/2009 | $ | 5.07 | 3 | 11Months |
| 469 | 7297690 | INSERT NEUTRAL,30MM | Nos | Local | 06/10/1994 | 06/10/1994 | 03/09/1995 | $ | 270.08 | 3 | 11Months |

**Comparison between present recoupment formula and selected item in 469 procurement history (Table: 7)**

| Procurement Type | Total procurement cycle | Present Ideal lead time in policy | Practically found average Lead time | Greater Time Required than present formula % | Number of item still not receive | Fulfilled time number procurement | present policy fulfil % procurement |
|---|---|---|---|---|---|---|---|
| **Foreign** | 275 | 6 months | 26.03 | 433.92% | 22 | 3 | 1.14% |
| **Local** | 194 | 4 months | 7.40 | 185.11% | 16 | 85 | 43.81% |

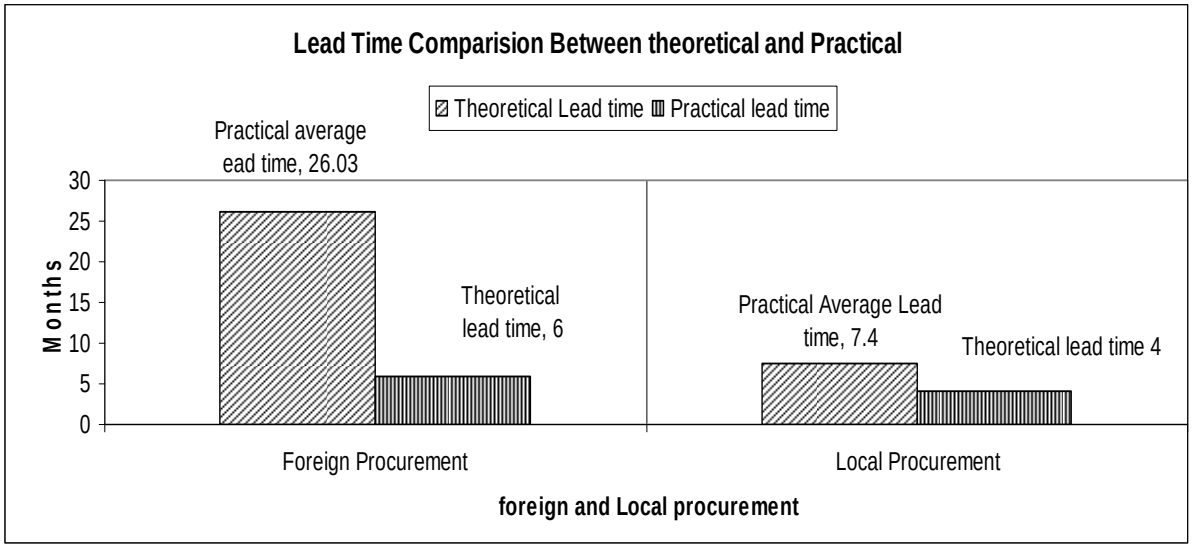


**Fig15: Lead time comparison between theoretical and practical**

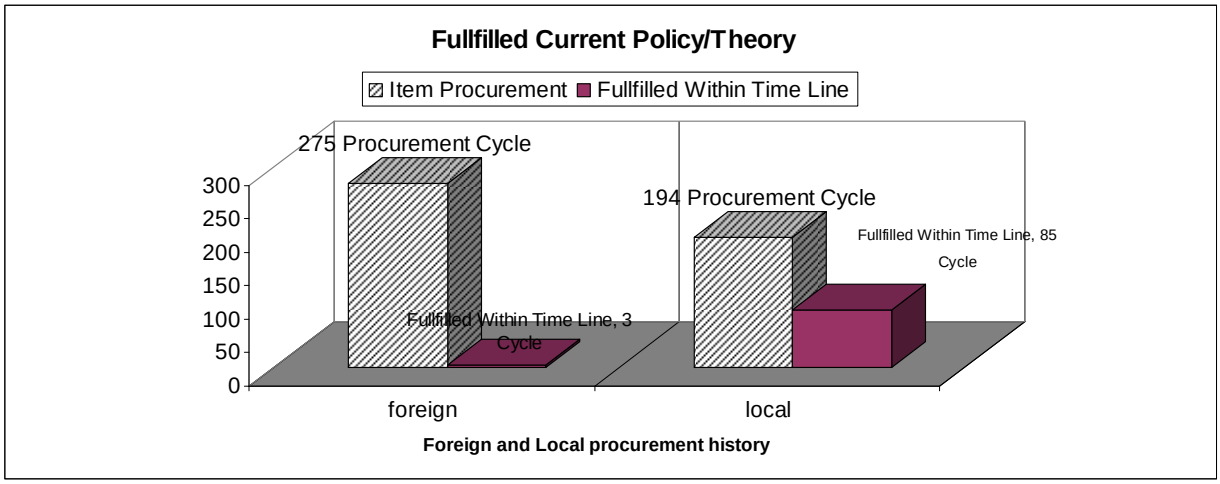


**Fig16: Percentage of fulfilled current policy**

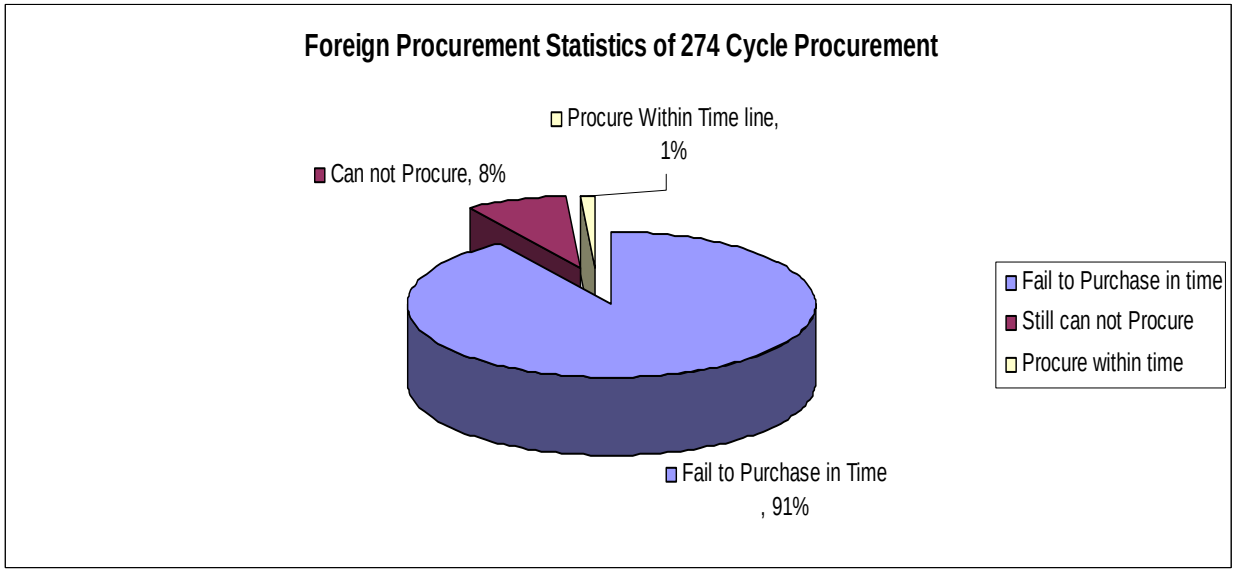


**Fig17: foreign procurement statistics of 274 cycles of procurement**

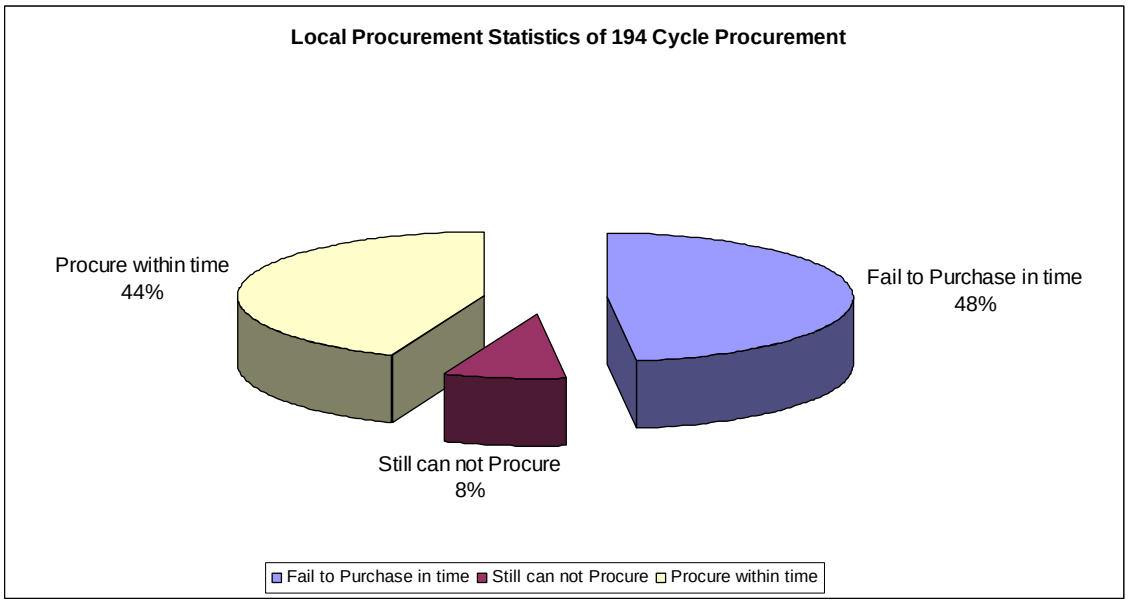


**Fig18: Local procurement statistics of 274 cycles of procurement**

### 4.2.1 Tender activities

**For foreign procurement in 275 numbers of procurement in different item:**

- Average number of days between SR (Stock Recoupment) to Receive item for foreign procurement is : 26.03 Months
- Where Ideal number of days between SR (Stock Recoupment) to receive item for foreign procurement is: 06 Months

**For local procurement in 194 numbers of procurement in different item:**

- Average number of days between SR (Stock Recoupment) to Receive item for foreign procurement is : 7.40 Months

Where Ideal number of days between SR (Stock Recoupment) to receive item for foreign procurement is: 4 Months

The figures show inefficiency in DIC as well as in purchase sections. These inefficiencies may be reduced by introducing automatic SR and PI generation using computerised

systems. The ideal lead time for SR to PI generation should not be more than 7 days. It is discovered that in many cases the PI contains items which were not procured previously. In that case preparation of official estimates becomes a challenge for the purchaser, as no information is available in the local market. Purchaser, generally, forms an estimate preparation committee and this is very time consuming. Regulations suggest to keep LT between IFT and NOA is 120 days and may be extended to 180 days with permission from HOPE. Therefore maximum LT between IFT and NOA should not exceed 180 days in any case. The LT between PI and PO is also unacceptable. Detailed investigation shows that sometimes TEC takes 8-12 months to finalise the tender. Moreover, for small value award suppliers do not submit requisite performance security and the consequence is delay in the issue of PO. Solution to the problem may be:

- Accept permanent security from enlisted tenderers, accounts must be maintained to keep record of such permanent security.
- Waive performance security for small value award; the value must be inserted in the Tender document.

The first two KPIs seem to be not acceptable.

### 4.3 Adherence and Compliances to Regulations

- % tender finalized within the timeline mentioned in the APP : **10**%
- % of contract completed within timeline : **72**%
- % of tender evaluation completed within timeline i.e. without extending the original tender validity : **10**%Average time between pre-qualification and approval of new potential foreign tenderer : **3** years
- % contract signed within 28 days of issuing NOA : **35**%

Tender finalisation timelines mentioned in the APP could not be followed by CCS. It has acceptable reasons, as described the procurement officials of CCS:

- Demand is generated in accordance with the re-order point system, depending on the actual consumption by DLW.
- It is unforeseen, when and how much demand would be generated.

- Therefore, APP is prepared only based on the previous purchase record, which in many cases might not come true.

The contract completion rate is satisfactory; however this KPI would have been better, if the suppliers could have been chased for.

Average times for successive prequalification and enlistment is 3 years. Regulations suggest to update the in every year. If fresh applications are invited, it is practically impossible to complete the prequalification and enlistment. Because it is a big task to scrutiny papers submitted by the applicants (suppliers) along with the application. Therefore, the following policy may be a solution:

- There should be a standing policy for pre-qualification and enlistment of foreign source of supply, as is in the case of local suppliers .The policy should clearly contain:
    - the appraisal criteria
    - Applicant qualification
    - Application procedure
    - Evaluation and approval procedure
    - Renewal procedure
    - Disqualification and de-listing
- With the approval from HOPE, CCS may constitute a standing Application evaluation Committee. This committee may be assisted with a Technical sub-committee.
- Application may be received round the year, but committee may seat only twice a year and report to DG for approval
- The committee may evaluate the performance of the enlisted supplier once a year, taking performance report from CCS, and may report to DG for renewal or delisting as the case may be.
- The enlistment process should be fair but robust and all application should be examined meticulously, as enlistment of right source is the key to getting right quality of materials at the right time.

### 4.4 Transparency of Procurement Process

- % of IFT delivered to all the approved qualified potential tenderers :**100**%
- % of IFT delivered directly to the approved potential foreign tenderers electronically :**0%**

- % of items having single source : **57%**
- % of tender cancelled due to unwanted political pressure : **0%**

IFT is delivered to each approved tenderers through their local agents. The tender cases studied by the researcher, it is found that no IFT is sent directly to the foreign tenders. But, though it is not mandatory in the PPR, presently IFT and Material Lists are being sent through e-mail and the potential tenderers are giving acknowledgement of IFT and tender receipt. Hence, the tendering process is very transparent.

### 4.5 Capacity of procurement management

- Average Number of IFT published per year by CCS : **1000 nos.**
- Average Number of IFT published per year for the procurement of loco-spares : **300 nos**.
- % of budget remains unspent during the last FY : **0.0 %**

CCS has to invite more or less 1000 numbers of tenders per year, including stores bulletins, OTM and DPM,. It is a gigantic figure. Perhaps, CCS is the top-1 ranked PE in Bangladesh who invites such a big numbers of tenders per year. For procuring loco-spares it has to invite 300 tenders per year. There is deficit of procurement budget in each year. CCS fails to sign contract for the accepted tenders due to shortage of budget. The consequence is, the demand is accumulated to the next year to give more negative impact to the budget for the next year.

The budget allocation and expenditure along with expenditure for the procurement of loco-spares are shown in the table below:

**Table 8: Budget Allocation and Expenditure of CCS Procurement**

| **FY** | **Allocation** | | **Expenditure** | | **Unspent** | | **Expenditure for Loco-spares** | | **Unspent % (Foreign)** (Crore BDT) |
|---|---|---|---|---|---|---|---|---|---|
| | Local (Crore BDT) | Foreign (Crore BDT) | Local (Crore BDT) | Foreign (Crore BDT) | Local (Crore BDT) | Foreign (Crore BDT) | Local (Crore BDT) | Foreign (Crore BDT) | |

| FY | Allocation | | Expenditure | | Unspent | | Expenditure for Loco-spares | | Unspent % (Foreign) (Crore BDT) |
|---|---|---|---|---|---|---|---|---|---|
| | Local (Crore BDT) | Foreign (Crore BDT) | Local (Crore BDT) | Foreign (Crore BDT) | Local (Crore BDT) | Foreign (Crore BDT) | Local (Crore BDT) | Foreign (Crore BDT) | |
| 2007-08 | 46 | 30 | 45.99 | 22.65 | 0.01 | 7.35 | - | 13.29 | 24.5% |
| 2008-09 | 55 | 42.76 | 54.70 | 41.51 | 0.30 | 1.25 | - | 37.17 | 2.92% |
| 2009-10 | 48 | 40 | 48 | 39.75 | 0.00 | 0.25 | 12.29 | 34.85 | 0.63% |
| 2010-11 | 47 | 40 | 46.82 | 38.48 | 0.18 | 1.52 | 6.82 | 36.36 | 3.8% |
| 2011-12 | 46 | 41 | 45.99 | 38.37 | 0.01 | 2.63 | 9.71 | 35.84 | 6.41% |
| 2012-13 | 46 | 45 | 45.99 | 24.39 | 0.01 | 20.66 | 6.52 | 44.95 | 45.91 % * |
| 2013-14 | 48 | 45 | 47.86 | 43 | 0.14 | 2.00 | 5.13 | 31.77 | 4.44% |
| 2014-15 | 41.49 | 45 | 48.49 | 41.44 | 0.05 | 3.56 | 7.82 | 26.59 | 31.42 % |
| 2015-16 | 68.82 | 45 | 68.82 | 45.01 | 0 | 0 | 11.51 | 35.28 | 0.00% |
| 2016-17 | 43 | 45 | 29.29 (Nov/16)) | 4.22 (Nov/16) | 39.71 | 40.78 | 4.79 (Nov/16) | 4.03 (Nov/16) | |

(*In FY 2012-13 the pattern is un-usual, therefore, Average unspent % is calculated ignoring this year's data)

CCS may pay more attention to ensure proper utilisation of limited budget.

### 4.6 HRM of Procurement Unit

- % of officer trained in PPR : 100%
- % of staff trained in PPR : **0%**
- Number of professional procurement specialists( MCIPS )in CCS office : 4

This result is very satisfactory. CCS should take steps to carry out a systematic training need analysis (TNA) for the staffs of procurement section, especially for those who are engaged in the international sourcing and contracting.

### 4.7 ICT Used in the Procurement Unit

CCS does not use modern ICT based planning and information management system. The whole procurement record management is based on manual and register based. Tender cases are processed in a unsecured MS access based customized software. The data remains unsecured as data change cannot be traced. ERP or e-procurement software may be used for fast, reliable and transparent procurement processing and record keeping.

### 4.8 Supplier Relationships Management

After signing the contract both supplier and the buyer have to discharge some responsibilities as mentioned in the contract and this is the case of a 'one-off' contract. The modern concept of maintaining ongoing supplier relationships, with a view to assess suppliers' performance so as to engage in long-term collaborative relationship, is not being practised by BR. No specific relationship is the best for all procurement. Kraljic portfolio matrix suggests that for loco-spares, being bottle neck items, purchasers priority is to ensure supply security and continuity of business. The appropriate action plan is to make medium to long term contracts with carefully prequalified and selected suppliers, developing alternative backup sources of supply, including incentives and penalties in contracts, and performance monitoring and expediting, to ensure the reliability of delivery.

### 4.9 Customer satisfaction

CCS is the only procuring entity for stock procurement. All other departments (Mechanical, Signal and Telecom, Electrical, Engineering, Personnel, Planning, RNB, Transportation and Commercial, and other operating units of BR) are the internal customers of CCS. This dissertation was focused only to the needs of the Pahartali diesel depot. The author collected data thorough questionnaire and in-depth interview with the WM, DLW, Pahartali data were collected regarding supply and demand fulfilment for the stock items.

The following KPIs give a picture of satisfaction and dissatisfaction:

- Total number of stock items : **2731** items
- Regularly used items : **2000** items
- Number of items demanded during 2015 : **310** items
- Number of items supplied from Stores depot : **279** items
- Number of items made available 'On Time in Full' (OTIF) : **75** items
- % of demand fulfillment : **90**%
- % of demand fulfillment on time : **24%**
- % of out of stock items : **20**%

The procurement function has fulfilled about 90% of demand which covers the 91% of total material budget of the customer. This result shows satisfaction of the customer. WM/DL/PHT has expressed that during year 2015 the procurement performance was satisfactory, in terms of availability of right quality materials at the right time.

# CHAPTER 5

# CONCLUSION AND RECOMMENDATION

## 5.1 CONCLUSION

From this dissertation I see that in present situation Bangladesh railway's procurement department (here known stores department) could not fulfil material demand in time. Where as it is very important to supply locomotive spare parts because if there would be any shortage of maintenance spare parts it create lack of shortage of locomotive as a result there occurs failure of train schedule. Now a days Bangladesh railway is a major transportation sector in Bangladesh. So it should be maintain its supply chain management very efficiently to continue its service properly.

From data analysis and result discussion I found following result on selected KPI which is summarized in the table.

### Result on selected KPI table 9:

| S/N | **Area of Evaluation** | **KPIs** | **Remarks** |
|---|---|---|---|
| 1 | Inventory Management | Does Bangladesh Railway maintain proper inventory control compare to its number of locomotive? | Very bad , not acceptable |
| 2 | Efficiency of Procurement Process | - Average number of days between SR to Receive<br>- % of contract completed within timeline<br>% of tender evaluation completed within timeline i.e. without extending the original tender validity | Very bad , not acceptable |
| 3 | Adherence to the PPR | - Average time between pre-qualification and approval of new potential foreign tenderer | Need development |

| | | | |
|---|---|---|---|
| | | - % contract signed within 28 days of issuing NOA | |
| 4 | Transparency of Procurement Process | - % of IFT delivered to all the approved qualified potential tenderers<br>- % of IFT delivered directly to the approved potential foreign tenderers electronically<br>- % of items having single source<br>- % of tender cancelled due to unwanted political pressure | acceptable |
| 5 | Capacity of procurement management | - Average Number of IFT published per year by CCS<br>- Average Number of IFT published per year for the procurement of loco-spares<br>- % of budget remains unspent during the last three FY | Acceptable |
| 6 | HRM of Procurement function | - % of procurement personnel trained in PPR<br>- Number of training events conducted in the last FY to improve skill of the procurement personnel | acceptable |
| 7 | ICT facilities in the procurement function | - Does CCS use MRP, MRP-II or ERP?<br>- Number of training events conducted in the last FY to improve skill of the procurement personnel | Need development |
| 8 | Procurement Discipline | - Does CCS use Supplier tiering?<br>- Does CCS use vendor rating?<br>- Does CCS segment their procurement portfolio | In present situation acceptable |

| | | | |
|---|---|---|---|
| | | - % of tender invited for long term collaborative basis with trusted suppliers, rather than inviting tender on 'one-off' basis?<br><br>Does CCS conduct systematic risk assessment in the procurement of loco-spares | |
| 9 | Customer satisfaction | - Number of items made available 'On Time in Full' (OTIF)<br>- % of demand fulfilment<br>- % of out of stock items<br>- Number of rejection due to quality failure<br><br>Number of delivery failed the 'need by date' | Not acceptable |

By considering selected result from the table we see that most of the KPI is acceptable in present situation among them inventory management and efficiency of procurement system is very bad situation. Main causes to failure procure within standard lead time are summarized below:

**1. Large inventory Compare to locomotives:**

I find out that Bangladesh railway have very large inventory compare to its locomotives. At present BR have only 277 number of locomotive whereas locomotives are 19 different types. These 19 different types create 27102 types of spare parts which is almost impossible to maintain in limited budget. I also find out that Bangladesh railway have no planning to maintain this large number of different type of locomotives where as its increase day by day. When new locomotives import from other country Bangladesh railway brings new type of locomotives as a result come new and new model every time which demand new type of spare parts . Some locomotives come from USA, some come from Canada, some come from India, and some come from South Korea as a result it create huge type of different spare parts compare to its locomotives.

2. **Old Model:** I also find out that at present Bangladesh railway's only 34 % of locomotives are in economic years which means below 20 years. Even I see that over 40 years locomotives are 35% (from table locomotive age profile). Even some type of locomotives gone to their museum for old heritage but still we use that type of locomotives. The consumers use the term 'vital' to denote important items for production which is out of stock of stores and cannot be procured from the local market and they change they items on monthly basis. This is a deviation from standard production and operations management. In standard practice, vital items are highly critical for production, absence of those causes stoppage of production. These items are fixed and need to stock in the high level.

3. New models are introduced to incorporate the design improvements and old models are phased out. These types of locomotives model already obsolete respective made in country. As a result now days they are not interested to produce these type of locomotive spare parts. We know that locomotive spare parts are special type of nature only original equipment manufacturer can produce its spare parts.

4. **Special type of Item:** In this world still only few countries can produce locomotives. Again its user also very limited number. Original equipment manufacturer (OEM) has legal authority to produce locomotive spare parts. It is not so easily fulfil demand from normal machinery market. So buyer has to communicate to very limited number of supplier to procure his spare parts.

5. **PPR 2008 creates some restriction:** Due to Special Type of Nature OEM (original equipment manufacturer) can produce the spare parts of each type of locomotives. As Bangladesh Railway uses very old model of locomotives they have no schedule production of that special model locomotives spare parts. Again Bangladesh Railway offers past purchase price to buy now for maintenance spare parts. But as they have no schedule production of those spare parts they become not interested to produce that special model locomotives spare parts. When BR insist to supply that spare parts they offer more price than previous past purchase price for special production of that spare

parts. But in PPR2008 their have a restriction to not exceed 5% more estimate price as a result purchase department fail to purchase and re tender again and again.

6. **Budget limitation:** Locomotives spare parts are purchased from govt revenue budget. There is a limitation of budget to fulfil all demand of locomotive spare parts. So higher authority take decision which spare parts should be priority to purchase.

7. **Lack of ethics:** Supplier have a huge contribution to purchase spare parts on time. As locomotive spare parts are special type of nature they take advantage from this. The purchase department has no alternative source of supply so sometime the supplier take unethical advantage from buyer by increasing price of these spare parts.

## 5.2 RECOMENDATIONS

### 5.2.1 Inventory Management of spare parts

(i) There should be a policy to strictly maintain not to diverse locomotive model. Because more type of locomotive more type of spare parts and more inventory.

(ii) Spares should be divided into segments according to their failure nature, value, availability, complexity in the market and criticality for the production. Systematic classification and codification may be introduces to identify items by the code number, for example: for what loco series, for what component, what source of procurement-shop made/ bought, what inventory and procurement policy applies to the item, etc.

(iii) Classification may be made based on other characteristics: capital spares, insurance spares, overhaul spares, wear and tear spares and consumable spares.

### 5.2.2 Change old Model Locomotives:

Bangladesh Railway should change its old locomotives which locomotives spare parts production is already stop by producer because without spare parts its maintenance is impossible. So Bangladesh railway should have been change systemically its old locomotives which are already gone over its economic life by one by one by controlling inventory to not create extra type of model and spare parts.

### 5.2.3 Change Lead time policy:

In present situation I found 469 procurement cycles in 174 different item following theoretical lead time and practical lead time which is mentioned under below:

**Table10: Lead time policy recommendation**

| Type of source | Present policy for lead time | Actual average lead time | Recommended new lead time set up | remarks |
|---|---|---|---|---|
| Foreign | 6 months | 26.03 months | 12 months | Other KPI need improve |
| Local | 4 months | 7.3 months | Need not change | Other KPI need improve |

From the table we see that sourcing from foreign country locomotive spare parts present practical lead time is 26.03 months where as we calculate for recoupment policy is only 6 months. This creates out of stock of that spare part in depot. So we need to stock more items at a time. At present situation theoretical lead time should be 12 months at least and other KPI for purchasing should improve.

Again in local item theoretical lead time is almost close to practical lead time which I found from 469 different procurement histories. Local lead time need not change it needs to improve other KPI which is vary in lead time performance.

### 5.2.4 Cross Functional Collaboration

(i) System for more regular oral and written communications of Inventory control, procurement, and workshops should be setup, to engage them systematically to contribute in procurement planning, acceptance of spares and technical decisions. A mini Stores Cell in the office of the DG, BR may be setup consisting of Director (stores), DD (Stores). Director (stores) may play a pivoting role for co-ordinations among procurement, inventory control and

workshops and DD (Stores) may play role of desk officer of the confidential sections of ADG (RS) for the finalisation of tenders. This will not only improve the procurement, acceptance and delivery performance but also contribute, considerably, expedite tender evaluation and finalization by TEC at RB.

(ii) Engage consuming department in the preparation of procurement plan and tender documents, so that their expectations can be addressed at the outset through the development of contract terms.

### 5.2.5 Use of Framework Agreement

CCS may procure low-value, frequently used items using long-term contracting options from reliable, trusted supplier, using framework contract agreement with the prequalified trusted suppliers.

### 5.2.6 Search More Genuine Local Source of Supply

To safe foreign currency as well as to reduce lead time of supply, more local source of supply for loco-spares may be approved and the process should be robust but fair. This may be considered as Business Continuity Plan (**BCP**) in the management of foreign suppliers' failure risk.

### 5.2.7 Procure Component-wise Lot-by-Lot , rather than item-by-item

To overcome un-quoting of low-value spares and to make the suppliers interested to do business with BR, more assembly, sub-assembly and components may be procured from the trusted suppliers, rather than procuring spare-parts in small amount.

### 5.2.8 HRM and Staff Training

Training of the procurement personnel, at each level of the staff involved, is vital to ensue, or enhance knowledge and improve skill at least up to the working level.

### 5.2.9 Finance and Budget

**a)** Sufficient budget must be allotted for proper maintenance of rolling stock. Because rolling stocks are the main resources of earning. As per yearly scheduled program of rolling stocks maintenance, budget should be prepared and sanctioned to achieve the targeted repair of the rolling stock.

**b)** Finance, accounts arid maintenance department should be integrated computer network to exchange information rapidly about budget preparation, expenditure and control.

**c)** Accounts and Finance department should prepare yearly balance sheet of each maintenance station and to disseminate information about loss and profit among the employees.

**d)** Each workshop (Maintenance station) should keep its own books for cost accounting for monthly settlement. Workshops may vary in scale and types of work each performs. The method of cost accounting, however, remains the same for all workshops regardless of their scale and types of work each perform.

### 5.2.10 Business Process Re-engineering (BPR)

Modern ICT (internet, intranet, extranet, etc.) based inventory and procurement management systems such as e-procurement and inventory modules of **ERP** software (e.g. SAP, Oracle) may be introduced for quicker, easier, and transparent and information risks managed procurement. To overcome strategic drift, present in the procurement processing systems, there is a need for radical change to utilize the development of ICT and the current procurement processes need to be re-engineered for the implementation of e-procurement system in the CCS office, implementing ERP systems (via intranet, extranet etc). Surely, this will involve a 'big change' and appropriate 'change management' along with appointing 'change champion' and **support from the people at the strategic level** will be required to make the change a success.

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# APPENDICES

**Appendix-A**

BRAC Institute of Governance and Development (BIGD)

BRAC University, Dhaka

**Questionare-1** **:** For the Procuring Entity

(CCS office, BR, Chittagong)

**Dissertation Topic** **: Compatibility of Bangladesh railway's locomotives spare parts current recoupment policy in present situation and assess efficiency and effectiveness of procurement function.**

(This is a survey questionnaire intended to perform an academic research with a view to exploring the Compatibility of Bangladesh railway's locomotives spare parts current recoupment policy in present condition and also to find out the ways to improve the current performance of the procurement function. Your honest response is valuable for the researcher. The researcher does assure that the information provided by you and your office will be kept confidential and will be used only for the academic purpose)

**Note:** Please put ✓ mark as appropriate

**Part-A:** You and your experience

1. Name :
2. Job Title :
3. Present Position :
   a. Senior Level
   b. Mid Level
   c. Junior Level
4. Over all Experience:
   a. 0-5 years
   b. 6-10 years
   c. 11-15 years
   d. 15+ years

5. Procurement Experience:
    a. 0-5 years
    b. 6-10 years
    c. 11-15 years
    d. 15+ years

**Part-B:** Your Opinion

1. Does the Procurement department can successfully done their procurement?
    a. Yes b. No

2. Have their any necessity to change current recoupment policy?
    a. Yes b. No

3. BR has about 277 diesel electric locomotives, how many items of spare-parts for locomotives do you have to procure annually?
    a. 500 to 1000
    b. 1000 to 5000
    c. 5000 to 10000
    d. 10000 to 15000

4. How do you get demand for the locomotive spare-parts from Pahartali Diesel Locomotive Workshop (Pahartali DLW)?
    a. Re-Order System
    b. Min-Max System
    c. As and when required system
    d. Others:

5. In Re-order system, demand is generated only when materials are issued and stock falls below a pre-determined stock level. In this case, how do you prepare Annual Procurement plan (APP) under the Public Procurement Rules (PPR), 2008?

    a. We do not prepare APP for Loco-Spare-parts.
    b. We consider previous year's consumption than revise it quarterly.
    c. Considering the past year's consumption we prepare an APP in the start of every FY and then we get approval of actual APP case-by-case basis.
    d. Others, please specify:

6. Does this procedure adhere to requirements of the PPR, 2008 ?

    a. Yes
    b. No
    c. No, but we had a consent from the CPTU as loco-Spare-parts are goods of specialised nature.

7. How many tenders do you need to invite for Loco spares procurement?

a. 50-100
b. 100-200
c. 200-300
d. 400-500
e. 500+

8. Why Loco spare-parts are considered as goods of specialised nature?

a. Its detailed specification is not available
b. It is manufactured by only few manufacturers in the world.
c. High lead time of procurement
d. It is not available in the local market.
e. They are only known by the part numbers given by the manufactures in the Part–catalogue.
f. All of the above
g. others

9. Do you have preferred suppliers (approve supplier) list for loco spare-parts?

a. Yes

b. No

10. How many suppliers do you have to maintain in your Loco- spares supplier loose?

a. 5-10

b. 10-15

c. 15-20

d. 20-30

e. 30-50

f. 50-100

11. Do you use supplier segmentation and supplier tiering to optimise your supplier base?

a. Yes

b. No

c. If yes, how?

12. Do you use e-procurement system?

a. Yes

b. No

13. How do you prepare official estimates for the Loco-spares?

    a. We use price list book by us

    b. We use price list book by us provided by the approved suppliers

    c. We conduct purchasing research

    d. we consider the last purchase price and for new items we constitute a estimate committee

    e. Others :

14. What method of tendering is generally followed, for procurement of loco- spares supplier?

    a. OTM

    b. LTM

    c. RFQ

    d. DPM

    e. Others.

15. Do you update your list of approved qualified potential suppler regularly?

    a. Yes

        - annually/ bi-annually/ every 3 years

    b. No

16. When did you publish the last potential supplier list?

    a. Date:

17. What is the minimum qualification criterion for the enlistment as potential Loco spare suppliers?

    a. General

        (a)

        (b)

b. Experience

(a)

(b)

c. Financial

(a)

(b)

18. Do you measure the efficiency of the procurement function?

a. Yes

b. No

19. What is the average lead time between:

a. Getting demand and inviting tender :----------months

b. Inviting tender and tender acceptance :----------months

c. Tender acceptance and contract signing :----------months

d. Contract signing and shipment :----------months

e. Shipment and delivery to depot :----------months

20. How lead time in each stage could be shorten:

a. .....

b. .....

21. Loco-spare supplies are geo-graphically dispersed. How do you sent tender document to them?

a. we deliver Tender Documents electronically direct to them

b. We deliver Tender Documents to their authorised Local Agent and send e-mail direct to the approved suppliers

c. Others

22. In your experience, what are the major challenges in the procurement of Loco-spares with the aim of satisfying the customers' needs of quality spare parts?

    a.

    b.

    c.

23. In the absence of material specifications at your end, as a purchaser how do you ensure the right quality of spare-parts?

    a.

    b.

24. What do you do when you get complaints from the consumer after the warranty period?

    a.

    b.

25. The public procurement Rules, 2008 has been enacted since 2008 and some provisions of the stores code regarding procurement has become null and void. What is the impact of the PPR on the procurement of Loco- spares?

    a.

    b.

26. How many spares have only one approved source?

    a. ----------Nos.

27. Do you thing long term collaborative agreement with qualified approved suppliers can improve the quality and delivery performance?

    (a) Yes (b) No

28. In your opinion, what is/are the bottle neck in the long supply chain starting from the demand generation to the demand fulfilment?

    a. Estimate preparation

    b. Comparator statement preparation

    c. Tender evaluation

d. Tender acutance

e. Contract agreement singing

f. L/C opening

g. Goods shipment.

29. Procurement of loco spares falls in the category international limited tendering amongst the approved qualified potential tenderise. Any international procurement poses some generic risks like currency risk, payment risk, difference in culture, language and time, quantity assurance risk. What are the specific risks for the procurement of loco spares that has to be addressed by the purchaser through contractual agreements between the suppliers and buyers to make it sustainable?

    a. Quality assurance

    b. Wrong supply

    c. Fraud

    d. Currency difference and fluctuation

    e. Obsolescence

    f. Others: please specify

30. Have you carried out any systematic risk assessment programme in organisation, especially for the management of procurement risk?

    a. Yes

        i. What are the risks identified in the assessment?

            (a)

        ii. What measures have been taken to manage the identified risks?

            (a)

    b. No

31. What types of contract terms do you use in the contract with suppliers to procure loco spares?

    a. STD published by CPTU (Please specify name):

    b. Modal form of contracts (Please specify name):

    c. Bespoke contracts: Tailored in each procurement and negotiated before contracting

    d. Others

32. How procurement data are captured for future reference

a. Maintaining purchase Register

b. Maintaining purchase Card for each item

c. Data eve entered into a customised computer data base.

d. We use ERP: procurement module

e. We do not capture data.

33. Do you think current system of data management is vulnerable to the risk of corruption and fraud?

| 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Lowest | | | | | Highest |

Reason for `0' :.....

34. What type of audit do you have to ensure compliance and interval control to avoid risk of procurement?

a. compliance audit by C&AG

b. Procurement post review by independent specialist procurement auditors as specified in the PPR, 2008.

c. Others please specify.

35. What are the major findings in the last audit reports in connection to the loco spare parts?

a.

b.

36. What specific measure you have taken to address those areas?

a.

b.

37. Do you face political pressure during enlistment of suppliers and procurement of loco spare-parts?

| 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Not at all | | | | | Strong |

38. Do you have any vendor rating programme to evaluate the current and past performance of the approved suppliers?

a. Yes

b. No.

39. Do you have any standing policy for the preparation of approved supplier base of loco spares?

    a. Yes

    b. No

40. How do you engage customers to improve their satisfaction?

    a. Involving them in the procurement process

    b. Regular oral and written communication

    c. Monthly meeting

    d. Others:

41. People are the heart of any organisation. Training is essential to develop skill of the people performing job. Do you have carried out any training need analysis (TNA) to identify skill gap:

    a. Yes

        i. How many training programme you have provided to the staff working in the procurement function?

    b. No

42. Do you have any plan to have MRP/ MRP-II/ ERP/e-Procurement?

    a. Yes

        (a) MRP

        (b) MRP-II

        (c) ERP

        (d) e-Procurement

----- Thank you for giving me your valuable time and effort------

**Appendix-B**

BRAC Institute of Governance and Development (BIGD)

BRAC University, Dhaka

**Questionare-2** **:** For the User Department

(Works Manager, DLW, Pahartali, Chittagong)

**Dissertation Topic : Compatibility of Bangladesh railway's locomotives spare parts current recoupment policy in present situation and assess efficiency and effectiveness of procurement function.**

(This is a survey questionnaire intended to perform an academic research with a view to exploring the current practices and challenges in the procurement of locomotive spare-parts by Bangladesh Railway and also to find out the ways to improve the current performance of the procurement function. Your honest response is valuable for the researcher. The researcher does assure that the information provided by you and your office will be kept confidential and will be used only for the academic purpose)

**Note:** Please put ✓ mark as appropriate, you are free to choose more than one where applicable

**Part-A:** <u>You and your experience</u>

6. Name :
7. Job Title :
8. Present Position :
   a. Senior Level
   b. Mid Level
   c. Junior Level

9. Over all Experience:
   a. 0-5 years
   b. 6-10 years
   c. 11-15 years

d. 15+ years

10. Loco- Maintenance Experience:
    a. 0-5 years
    b. 6-10 years
    c. 11-15 years
    d. 15+ years

**Part-B:** Your Opinion

11. BR has about 277 diesel electric locomotives, how many locomotives do you have to maintain per year?
    a. F-Schedule :
    b. G-schedule :
    c. Special :
    d. Others :
12. In any manufacturing or workshop environment 4Ms (Man, Material, Money and Management) are important. In your experience, for your workshop how do you rate the following them, in terms of your management time and effort?
    a. Man : %
    b. Material : %
    c. Money : %
    d. Management : %
13. How many locomotives were scheduled for maintenance in the FY 2014-15?
    a. _____No.
14. How many locomotives were maintained in FY 2014-15 ?
    a. _____No.
15. Percentage of target achieved: %
16. Could you give the following information?
    - ❒ No. of items demanded in the last FY?
    - ❒ No. of items supplied in full from stores?
    - ❒ No. of items partially supplied?
    - ❒ No. of items rejected due to inferior quality or wrong supply?
    - ❒ No. of vital items?

17. How do you manage the loco-maintenance works, when stores depot fails to supply the demanded materials?
    a. Cannibalization
    b. Procure local materials or foreign materials from local suppliers to meet emergency
    c. Others, Please specify ..... ..... ..... ..... ..... ..... ..

18. Do you think the current procurement systems followed by the Procurement Function (CCS office) of BR need to be overhauled to meet your demand?

    a. No

    b. Yes, please specify: (You are free to choose more than one)

(a) CCS may procure more sub-assembly, assembly or components rather than procuring spare-parts

(b) CCS may give more emphasis on component overhauling at CLW, through R&R programme, to support F&G schedule of diesel workshop

(c) CCS should search more local source of supply for spare-parts

(d) Others, please specify: ..... ..... ..... ..... ..... ....

19. Why Loco spare-parts are considered as goods of specialized nature?
    a. Its detailed specification is not available
    b. It is manufactured by only few manufacturers in the world.
    c. High lead time of procurement
    d. It is not available in the local market.
    e. They are only known by the part numbers given by the manufactures in the Part–catalogue.
    f. All of the above
    g. others

20. In the last FY 2014-15, what was the strength of your materials budget in BDT?

    a. _____ Crore

21. What was the pattern of utilisation of budget?

    a. Spent to draw materials from stores depot : Crore

    b. Spent to purchase through local suppliers : Crore

    c. Remains unspent due to non-availability of materials : Crore

22. How do you rate the service level performed by the procurement function of BR in the Procurement of foreign sourced loco-spares?

| | | | | | |
|---|---|---|---|---|---|
| Lowest | | | | | Highest |

Reason for 0: ----------

23. How many items are vital for your workshop for the month of January, 2016?

    a. ---------- Nos.

24. How do you define ‘vital’ item?

    .....

25. In the absence of material specifications, except part number, at your end, as a consumer, how do you ensure the right quality of spare-parts?

    a.

b.

26. In the absence of material specifications at purchaser's end, except part number, how can the procurement function assure and ensure the right quality of spare-parts?

a.

b.

27. What could be done to avoid complaints from the consumer after the warranty period?

a. The incoming spare-parts of stores depot should be checked by the consumer regarding suitability, before giving final acceptance and suppliers should be paid only after acceptance from the consumer.

b. The warranty period should be extended up to two years

c. The wrong supply should be replaced if detected even after the warranty period

d. Others:
.....
.....

e.

28. Do you thing long term collaborative agreement with qualified approved suppliers can improve the quality and delivery performance?

(a) Yes (b) No

29. Do you thing more open, collaborative engagement of consumers in the early stages of procurement can improve your satisfaction as a customer?

f. No

g. Yes: how?

(e) preparation of specification

(f) preparation of tender document and contract terms

(g) evaluation of tender and awarding the contract

(h) acceptance of materials

h. Regular oral and written communication

i. Monthly meeting

j. Others:

30. If anything not covered, but seems, to you, may help improve the materials availability?

k. ----------

l. ----------

m. ----------

---Thank you for giving me you valuable time and effort.

**Appendix-C**

BRAC Institute of Governance and Development (BIGD)

BRAC University, Dhaka

**Questionare-3** **:** For the User/ Procurement Department

(Expert Opinion)

**Dissertation Topic : Compatibility of Bangladesh railway's locomotives spare parts current recoupment policy in present situation and assess efficiency and effectiveness of procurement function.**

(This is a survey questionnaire intended to perform an academic research with a view to exploring the current practices and challenges in the procurement of locomotive spare-parts by Bangladesh Railway and also to find out the ways to improve the current performance of the procurement function. Your honest response is valuable for the researcher. The researcher does assure that the information provided by you and your office will be kept confidential and will be used only for the academic purpose)

**Note:** Please put ✓ mark as appropriate, you are free to choose more than one where applicable

**Part-A:** You and your experience

1. Name :
2. Job Title :
3. Present Position :
   a. Senior Level
   b. Mid Level
   c. Junior Level
4. Over all Experience:
   a. 0-5 years
   b. 6-10 years
   c. 11-15 years
   d. 15+ years
5. Loco- Maintenance/ Spare-parts Procurement Experience:
   a. 0-5 years

b. 6-10 years
c. 11-15 years
d. 15+ years

**Part-B:** Your Opinion

1. Do you think that in present situation procurement department can fulfill material demand in time?

   a. Yes

   b. No

2. In any manufacturing or workshop environment 4Ms (Man, Material, Money and Management) are important. In your experience, for locomotive workshop of BR how do you rate the following them, in terms of your management time and effort?

   a. Man : %
   b. Material : %
   c. Money : %
   d. Management : %

3. How do the Works Managers manage the loco-maintenance works, when stores depot fails to supply the demanded materials in the right time?

   a. Cannibalization
   b. Procure local materials or foreign materials from local suppliers to meet emergency
   c. Others, Please specify ..... ..... ..... ..... ..... .....

4. Do you think the current procurement systems followed by the Procurement Function (CCS office) of BR need to be overhauled to meet present demand and to improve consumer's satisfaction?

   a. No

   b. Yes, please specify: (You are free to choose more than one)

      (a) CCS may procure more sub-assembly, assembly or components rather than procuring spare-parts

      (b) Spare-parts could be procured only from the renowned loco-builder, assembles and the Original Equipment Manufacturers

(c) CCS may give more emphasis on component overhauling at CLW, through R&R programme, to support F&G schedule of diesel workshop

(d) CCS should search more local source of supply for spare-parts

(e) CCS office should engage users in the procurement process, so that their expectations can be addressed through the contract terms.

(f) CCS could develop a standing policy for the approval of foreign sources as potential tenderer, and there should be a standing committee for evaluation of the applications of the foreign suppliers, as well as evaluation of the performance of the approved suppliers and they could report to the procuring entity twice a year.

(g) Others, please specify: ..... ..... ..... ..... .....

5. Why Loco spare-parts are considered as goods of specialized nature?
    a. Its detailed specification is not available
    b. It is manufactured by only few manufacturers in the world.
    c. High lead time of procurement
    d. It is not available in the local market.
    e. They are only known by the part numbers given by the manufactures in the Part–catalogue.
    f. All of the above
    g. Others

6. How do you rate the service level performed by the procurement function of BR in the Procurement of foreign sourced loco-spares?

| 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Lowest | | | | | Highest |

Reason for 0: ----------

7. In the absence of material specifications, except part number, at user end, as a consumer, how could they ensure the right quality of spare-parts?

a.

b.

8. In the absence of material specifications, except part number, at purchaser's end, how could the procurement function assure and ensure the right quality of spare-parts?

    a.

    b.

9. Managing the MDM (Manuscript Memorandum of Differences) has become a challenge or the procuring entity, particularly for the complaints raised, by the users beyond the warranty period, for the loco-spare procured from the foreign source. What could be done to avoid complaints from the consumer after the warranty period?

    a. The incoming spare-parts of stores depot should be checked by the consumer regarding suitability, before giving final acceptance and suppliers should be paid only after acceptance from the consumer.

    b. The warranty period should be extended up to_____ years

    c. The wrong supply should be replaced if detected even after the warranty period

    d. Others: .....

10. Do you thing long term collaborative agreement with qualified approved suppliers can improve the quality and delivery performance?

        (a) Yes (b) No

11. Do you thing more frequent and open communication and engagement with users in the early stages of procurement can improve user's satisfaction?

    a. No

    b. Yes: how?

        (h) preparation of specification

        (i) preparation of tender document and contract terms

        (j) evaluation of tender and awarding the contract

        (k) acceptance of materials

c. Regular oral and written communication

d. Monthly meeting

e. Others:

12. Procurement of loco spares falls in the category international limited tendering amongst the approved qualified potential tenderise. Any international procurement poses some generic risks like currency risk, payment risk, difference in culture, language and time, quantity assurance risk. What are the specific risks for the procurement of loco spares that has to be addressed by the purchaser through contractual agreements between the suppliers and buyers to make it sustainable?

    a. Quality assurance

    b. Wrong supply

    c. Fraud

    d. Money laundering

    e. Currency difference and fluctuation

    f. Obsolescence

    g. Others: please specify

13. For the procurement of loco spare-parts from foreign suppliers, the contract terms exercised by the procurement function (Stores Department) of BR is CFR/ Chittagong Sea Port. And the payment is made through letter of credit (L/C), the payment is made to the 100% contract value (CFR/ CTG value) on shipment and production of the shipping documents. No pre-shipment inspection is done as it is not possible without detailed specifications of the spare-parts. The only means of assuring quality is the 'Manufacturer's certificate' and 'Warranty certificates' issued by the suppliers/ manufacturers. In your opinion, how risky the payment term is for the purchaser in terms getting correct spare-parts of right quality?

| 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Lowest | | | | | Highest |

Reason for 0: ----------

14. What contract terms could be added to minimise the risk, mentioned in Q 11, with a view to transfer the risk to the suppliers and/or to spread the risk to the users?

    a. ----------

    b. ----------

15. In your experience, what are the major challenges in the procurement of Loco- spares with the aim of satisfying the customers' needs of quality spare parts at the right time?

    a.

    b.

16. If anything not covered, but seems, to you, may help improve the materials availability?

    a. ----------

    b. ----------

    ---Thank you for giving me you valuable time and effort.