

**Financial Analysis for international purchase of spare parts by
SO.NA.RA refinery.**

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<p>Globalization has made it possible to buy from all over the world in an easy, safe and fast way. When buying abroad, it is always advantageous to buy from countries having comparative advantage in the production of these goods. The research objective is how to reduce the cost of machine maintenance in order to avoid frequent production shutdown and improve production efficiency by evaluating cost of maintenance. (Labor, spare parts purchase etc.)</p> <p>The suppliers of great interest are ASCO Inc, Rembe Inc, RMT Valvomeccanica Inc and Metso Corporation. These suppliers either manufacture these spare parts and/or retail these products. The spare parts of great concern are petrochemical valves, and the research was done by performing an interview with both the suppliers and the commissioning company.</p> <p>The result shows that purchasing durable spare parts from Europe have a positive impact on the cost of machine maintenance. Two suppliers were analyzed which were ASCO Inc. based in Sweden and REMBE Inc. based in Germany. The supplier selected is REMBE Inc., but further research is needed in order to determine the supplier with the best quality spare parts.</p>	
<p>Keywords Comparative advantage, Cost Management, International Purchase, Qualitative research method</p>	

Table of contents

1	Introduction	4
1.1	Research background	4
1.2	Research problem	5
1.3	Demarcation	5
1.4	Key concepts	6
1.5	Case company	6
1.6	Structure of the report	7
2	Case company introduction	8
2.1	Case company's growth plan	9
3	Suppliers introduction.....	10
3.1	ASCO valve Inc.	10
3.2	Rembe Inc.	11
3.3	RMT valvomeccanica Inc.	12
3.4	Metso corporation	14
4	Spare Parts Description	15
4.1	Combustion valves	15
4.2	Solenoid valves.....	16
4.3	Digital pressure / vacuum sensors.....	16
4.4	Numatics dryers	17
4.5	Non-return explosion valve	17
4.6	Ball valves	18
5	Import restrictions.....	19
5.1	Tariffs	20
5.2	Exchange permit.....	20
5.3	Quotas	20
5.4	Import licenses.....	21
5.5	Standards.....	21
5.6	Other restrictions.....	21
6	Foreign commercial payments	22
6.1	Letter of Credit	22

6.2	Bill of Exchange	24
6.3	Cash in Advance	25
6.4	Open accounts	25
6.5	Forfaiting	25
7	Budgeting and transportation mode	26
7.1	The master budget	26
7.2	Purchase budget	28
7.3	Cash outflow budget.....	28
7.4	Transportation mode	28
8	Empirical Research Objective.....	30
8.1	Thesis topic	30
8.2	Research problem and research questions	30
8.3	Research methodology.....	31
8.4	Research method/data collection.....	32
8.5	Data analysis.....	33
8.6	Data validity.....	33
8.7	Research questionnaire	34
8.8	Demarcation.....	36
9	Results and analysis	38
9.1	Purchasing Manager Interview Analysis.....	38
9.2	Financial Manager Interview Analysis	41
9.3	ASCO and REMBE valves Inc. interview analysis	42
10	Calculations	45
10.1	Purchasing cost per supplier	45
10.2	Transportation cost per supplier (to Hamburg).....	46
10.3	Transportation cost to Cameroon (from Hamburg)	48
10.4	Effect on cost of maintenance	49
11	Budget preparation.....	52
11.1	Purchase budget.....	52
11.2	Cash outflow	53
12	Discussion and conclusion.....	54
12.1	Summary and interpretation of results	54

12.2	Validity of the research.....	55
12.3	Suggestions for further research.....	55
12.4	Thesis learning process.....	56
	References.....	58
	Attachment 1. Overlay Matrix.....	60
	Attachment 2. Interview Response.....	61
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1 Introduction

For a manufacturing company to achieve its vision, it must be profitable and demand for its products must subsequently increase. Manufacturing companies must always keep their machines running in order for them to attain a high level of output. Globalization has made it possible to buy from all over the world in an easy, safe and fast way. When buying abroad, it is always advantageous to buy from countries having comparative advantage in the production of these goods. (Theory of comparative advantage, David Ricardo 1816, 1).

Buying goods internationally involve a lot of financial considerations like tariffs and import taxes, transportation costs, freight forwarders and so on. For a company to be profitable and successful, it should be competitive within its industry by maintaining its production and avoid product shortages.

1.1 Research background

The main reason for carrying out this research is because the SO.NA.RA refinery in Cameroon is expanding its production capacity by the year 2015 from 2.1 million tons per annum to 4 million tons per annum. Due to advanced technology, there are new and improved spare parts designed to improve industrial safety. In the petrochemical industry, there is a possibility of an explosion, fire or toxic gases leaking from turbines which might be caused by over heating or high pressure in the turbines.

The SO.NA.RA refinery in Cameroon, refines hard crude oil into final products such as; petrol, diesel, gas, aviation fuel etc. These products are sold in Cameroon and its surrounding countries. Constant production, corporate social responsibility and customer satisfaction is their main objective. To achieve all these, the company has to keep their refinery running for 24hours. (<http://abarrelfull.wikidot.com/limbe-refinery>, 2011)

The study of this research is to assist the SO.NA.RA refinery in Cameroon achieve its production goal by looking for potential suppliers of their machines' spare parts. These machines operate 24 hours, seven days a week, and the company is planning to implement a yearly maintenance program (presently, maintenance is done between two to four times in a year). Presently, the SO.NA.RA refinery in Cameroon purchases its spare parts from China. (Marshal E. 15.06.2012a)

1.2 Research problem

The research problem is to analyse the cost of maintenance caused by frequent machine failure and it is formulated as follows:

How to reduce the cost of machine maintenance in order to avoid frequent production shutdown and improve production efficiency?

The author assumes that these spare parts have a good quality since the suppliers assured the author that their spare parts can be functional for up to a year before any form of default can occur. Also, these supplies must be chosen from Europe specifically within the European Union.

1.3 Demarcation

A quantitative method on the quality of these spare parts will not be done; this is because it has to do with a lot of confidentiality documents that cannot be given out. Also, this might affect the suppliers' competitive advantage by exposing their manufacturing techniques.

All of the documents needed for international purchase will not be considered. Most importantly, the research is only based on the prices and cost of transporting these spare parts from Europe to Cameroon. Other issues such as; governmental policies for international purchase are irrelevant in this research. Also, this research will be concen-

trated on the costs and expenses that are involved in this purchase as well as the affect it has on the cost of machine maintenance. Branding and manufacturer reputation is not considered since it is obvious that manufacturers having a well-known global reputation sell their products at a high price. Meanwhile, there are new manufacturers producing high quality products whose brand names are not globally recognized.

1.4 Key concepts

A few concepts and theories are considered such as:

1. Marketing research procedures
2. International purchase and Logistics
3. Cost accounting and cost management
4. Budgeting

The theoretical framework covers a lot of marketing concepts and theories (with a bit of logistics) meanwhile the empirical research is based on accounting concepts and principles. This means that there is a balance between marketing research and accounting. This is obvious because you cannot purchase goods internationally with out doing any marketing feasibility studies.

1.5 Case company

The case company is the SO.NA.RA refinery in Cameroon created in 1981 and based in Limbe the South West Province of the Republic of Cameroon. This company refines crude oil into petroleum products such as: petrol, gas and so on. The company has four owners and the Cameroon government has the greatest shares (66%). The language of operation is French and English with French being the major language.

1.6 Structure of the report

The structure is very simple and start with the title page, abstract, table of content, introduction, Body of the report, discussion and conclusion, references and finally, attachments. The body of the report is divided into two parts: The theoretical framework that describes some theories used in the research and the empirical study that describe the research method, research findings and analysis.

2 Case company introduction

The SO.NA.RA oil refinery in Cameroon was created in 1981 to refine light crude oil imported from Equatorial Guinea, Nigeria and Angola into finished products such as butane, fuel oil, naphtha and gas oil. The company is located at Cape Lemboh, South West Province of Cameroon with a capacity of 2.1 million-tons per annum. The company's ownership structure is shown below (<http://abarrelfull.wikidot.com/limbe-refinery>, 2011).



Figure 1: View of SO.NA.RA refinery.

Table 1: SO.NA.RA (Société Nationale de Raffinage) Ownership.

(<http://abarrelfull.wikidot.com/limbe-refinery>, 2011)

Owners	Percentage of Ownership
Cameroon Government	66%
TOTAL	18%
ExxonMobil Corporation	8%
Shell International Ltd	8%
Total	100%

SO.NA.RA refinery has the following refining units

1. Crude refining unit 45,000
2. Catalytic reformer 11,000
3. Naphtha hydrotreater 12,000
4. Distillate hydrotreater 3,500.

(<http://abarrelfull.wikidot.com/limbe-refinery>, 2011)

2.1 Case company's growth plan

Cameroon SO.NA.RA refinery, which is the lone crude processor in central Africa, will receive a loan of 75 billion CFA francs (164 million dollars) from eight international banks to fund its expansion. This loan will help to fund the company's expansion from 2.1 million tons per annum to 4 million tons per annum by 2015 and the company will be able to refine the heavy crude oil that is being extracted locally rather than the company solely depending on light crude oil imported from other countries. (Marshal E. 15.06.2012a)

The lenders include big international banks which are: United Kingdom based Standard Chartered PLC, Société General SA's unit in Cameroon, Lome-based Banque Atlantique and the mighty Commercial Bank Cameroon. Due to its expansion, this company needs to maintain its operations thus; there is a need for durable and high quality spare parts. (Marshal E. 15.06.2012a)

A number of spare parts are needed which are: motor pumps, electrical pumps, valves, tubes, electric generators, construction rings just to mention a few. But what we frequently need are valves since they are very vital for the refinery's operations and the safety of employees. We will like the research to focus on the purchase of quality valves that can avoid production shutdown and improve production efficiency. (Marshal E. 28.06.2012b)

3 Suppliers introduction

A total of four suppliers will be contacted for a complete list of prices for their spare parts that will be used by the author for analysis. All suppliers are based in Europe with Europe being the main point of supply. The currency of the entire thesis is Euro. The currency of The Republic of Cameroon is the CFA Franc (Central African Franc) which is pegged to the Euro with an exchange rate of 1 Euro = CFA 655.957. (<http://www.cfafranc.com/>, 2012)

Table 2: Suppliers summary Table

Supplier	Location
Asco Valve Inc	Sweden/Finland
Rembe Inc	Germany
RMT Valvomeccanica Inc	Italy
Metso Corporation	Finland

3.1 ASCO valve Inc.

Asco/Joucomatic (ASCO AB)

Albanoliden 3-5

506 30 Boras,

Sweden

In 1888, ASCO was created in the United State of America and its main operations were manufacturing elevators, compressors and generator controls. In 1910, they became the first company to manufacture a new electrically operated control solenoid valve device. Then they continue their research and later developed new products, which control the flow of air, gas, water, oil and steam (all kinds of liquid and gaseous substances). (ASCO Inc. 2012.)

ASCO began its international expansion in the late 1950's and now they have their manufacturing and sales operations in over 42 countries. In the mid 1970's, some additional products were introduced into the market, which are: air-operated valves, manual reset valves and pressure and temperature switches. (ASCO Inc. 2012.)

Today, ASCO Valve Inc. is committed to become a worldwide leader in valves and valve system technology both in the design and manufacture of quality fluid control products such as: Redhat solenoid valves, miniature valves, fuel gas and oil product, and redundant control systems. They are committed to satisfy their customers by providing minor modification of their core products or a complete flow control solution. ASCO Valve Inc.'s headquarter is in 50-60 Hanover Road, Florham Park, NJ 07932, United State of America. (ASCO Inc. 2012.) They have several distributors all over the world with one in Vantaa-Finland (WEXON, Juhanilantie 4, 01740 Vantaa. www.wexon.com)

3.2 Rembe Inc.

REMBE INC.

3809 Beam Road, Suite K

Charlotte, NC 28217

REMBE was established in 1973 in Brilon, Germany as a consulting, engineering and safety technology manufacturer. From the onset, REMBE's main objective was to offer products and individual consultancy encompassing solutions in solving customers' individual problems. (REMBE Inc. 2012.) Operating initially in partnership with a U.S. manufacturer, they developed a variety of pressure relief bursting discs and invest more in the Research and Development of new products. (REMBE Inc. 2012.)

REMBE's partnership with the U.S. manufacturer ended in 1977 and they later established their own innovative product with general observed quality standards. With the company's experience in application solutions of pressure relief products in a number of industrial sectors such as chemical and food & Beverages, REMBE incorporated its technology division in 1978. (REMBE Inc. 2012.) REMBE expanded internationally

since 1988 and they are now represented in more than 70 countries. In 2003 REMBE's trademark was changed to REMBE GMBH SAFETY + CONTROL and their divisions were renamed to SAFETY Division and CONTROL Division. (REMBE Inc. 2012.)

REMBE as a medium sized company employs over 100 employees in Research and Development, manufacturing, sales, administration and servicing. REMBE's subsidiary (REMBE Inc.) located in Charlotte, North Carolina, was created in 2006 to serve their customers in North America by continuing the tradition of providing a top quality explosive protection, isolation and process safety products and services in every industry. Their representatives in the US provide their customers with consultation, engineering, design and sales support for their explosion protection and process safety products. (REMBE Inc. 2012.)

For German customers the Brilon headquarter in cooperation with two independent sales offices and four distributors are responsible for sales and application consultancy services. In South East Asia, Australia and New Zealand the REMBE Singapore Representative Office serves their customers. REMBE LTD office in London serves the U.K. and Ireland customers and REMBE customers in Finland, REMBE Oy, Helsinki is responsible for sales and consultancy. REMBE S.R.L., in Milan-Italy serves the Italian customers. Finally, for international customers, the Brilon headquarters upon agreement with the local sales partners in the corresponding countries worldwide performs sales and application consultancy services. (REMBE Inc. 2012.) In this way REMBE can assure each customer of the best solution and service for an explosion process safety system that meets their particular circumstances.

3.3 RMT valvomeccanica Inc.

RMT VALVOMECCANICA SRL

Headquarters

Via dei Patrioti

21058 - SOLBIATE OLONA(VA) - Italy

RMT Valvomeccanica is one of the oldest valve manufacturers in Italy. They focus on lubricated plug valves in standard and invented pressure-balanced designs since 1950. They operated successfully for 40 years, improving its skills and capabilities but were liquidated in the beginning of the '90s due to globalization and other market factors. (RMT Valvomeccanica Inc. 2012.)

In 1988 they founded a new beginning with the name "La Valvomeccanica S.P.A." incorporated in Solbiate Olona (VA) and was listed as a public limited company which was specialized in small and medium sized ball valves. RMT Valves s.r.l was also established in Voghera in 1988 as a trading company supplying services to major worldwide Engineering and Construction companies for all types of on-off valves such as ball, gate, globe, check, butterfly and plug. (RMT Valvomeccanica Inc. 2012.)

The good collaboration between the two companies in 2008 led to them merging to form RMT Valvomeccanica s.r.l. RMT Valvomeccanica is included in the GIVA group, which is an Italian group founded by Mr. Antonio Vienna in 1962 (North Italy). (RMT Valvomeccanica Inc. 2012.)

The factory and the headquarter of the RMT Valvomeccanica are located in the town of Solbiate Olona, which is in the North of Milan in the very heart of the Italian and European valve industry, at a short driving distance from most of the main sub suppliers of raw materials and other components. (RMT Valvomeccanica Inc. 2012.) RMT Valvomeccanica is manufacturing small and big sized ball valves and they are dedicated in developing new designs and manufacture of ball valves in a multiplicity of materials such as: carbon and stainless steel, duplex and super duplex, inconel and incoloy. Their valves are currently employed globally in many applications and industries such as: oil and gas, chemical, petrochemical, naval, pharmaceutical, power, offshore etc. (RMT Valvomeccanica Inc. 2012.)

3.4 Metso corporation

In 1999 Metso was created through the merger of Valmet and Rauma. Valmet was a complete paper and board machine supplier and became a well known supplier within three years of operation, while Rauma's operations were focused mainly on fiber technology, rock crushing and flow control solutions. This merger produced an equipment supplier, which served the global process industry. (Metso Corporation 2012)

Metso is a global supplier of technology and services to customers in the process industries, including mining, construction, pulp and paper, power, and oil and gas. They are truly global - Worldwide and employ about 30,000 professionals based in over 50 countries delivers sustainability and profitability to customers worldwide. Metso provides oil refineries with high-performance valves that serve from crude distillation to final products. With their valve technology, refineries are able to minimize the risks related to health, the environment and safety. Additionally, their valves play an important role in manufacturing plants reaching their product quality targets, as well as reduce maintenance and plant shutdown costs. (Metso Corporation 2012)

Metso provide valves for naphtha crackers, MEG plants and everything in between. Their wide offering consists not only control valve applications but also emergency shutdown, blow down and other critical automated on-off applications for petrochemical industries. Petrochemical applications are always a bit different from one processing point to another. Metso provide the following valve solutions: rotary plug, Q-trim ball, high- performance butterfly valve or segmented ball valve. (Metso Corporation 2012)

4 Spare Parts Description

As requested by the SO.NA.RA refinery in Cameroon, the size and dimension of the valves are not specific but the functions of the valves are very important. The availability of newly modified valves is highly recommended since they will be sustainable for a longer period. The metal used in manufacturing the valves should be consider (stainless steel is preferable). (Marshal E. 15.06.2012b). This chapter describes each valve and its functionality; if possible the metal used in manufacturing the valves will be mentioned.

4.1 Combustion valves

ASCO Valve's Fuel, Gas & Oil solenoid valves handle combustion system & main line fuel shutoff & control needs. Fuel, Gas & Oil solenoid valves are available in 2-ways normally closed, normally open, manual reset, and 3-way diversion. These valves are available in brass, aluminum, and stainless steel. Valve features include junction box, pipe taps, visual indication, and proof of closure, leading agency approvals, and pipe connections from 1/8 inch to 3 inches. Most valves are rated for -40°F service for outdoor installation in frigid climates. (ASCO Inc. 2012.)



Figure 2: ASCO combustion valve (ASCO Inc. 2012.)

4.2 Solenoid valves

This is an electromagnetic part of a valve, comprised of a coil, core tube, core and enclosure. This selection of 2-, 3- and 4-way solenoid valves, designed to handle the most demanding fluid control applications. This valve has been technologically proven to deliver reliable operation for both two-way and on-off process valves. The application of these valves range from water treatment to steam distribution on the process boiler to pilot the control valves for the loading of ethanol onto trucks and rail cars. (ASCO Inc. 2012.)



Figure 3: Solenoid Valve (ASCO Inc. 2012.)

4.3 Digital pressure / vacuum sensors

Numatics filter regulators DPS / DVS 280 series digital sensors is used as a digital pressure / vacuum gauge for accurate visual display of the current value. They can also be used as a control device by treating air quality and pressure in the plant's pneumatic system. They also control pressure or meet filtration requirements for pneumatic equipment. They are available in multiple configurations. (ASCO Inc. 2012.)



Figure 4: Numatics filter regulators DPS / DVS 280 series digital sensors (ASCO Inc. 2012.)

4.4 Numatics dryers

Moisture in the compressed air system is reduced by this numatics dryer at the point of use or post-compressor. These dryers provide superior results when moisture is an issue for pneumatic process equipment. They are available in two forms: as regenerative and refrigerated systems. (ASCO Inc. 2012.)



Figure 5: Numatics Dryers (ASCO Inc. 2012.)

4.5 Non-return explosion valve

With the non-return explosion valve Compact explosions in nearly all-industrial sectors can effectively be isolated. The Q-Flap[®]Compact is certified as a protective system according to European Union guideline 94/9/EG (ATEX 114) and approved for decoupling explosions of organic and inorganic dusts. (REMBE Inc. 2012.)



Figure 6: Non-return Explosion Valve - Q-Flap[®]Compact (REMBE Inc. 2012.)

The non-return valve is easily maintained since it can be opened completely, that means quick maintenance without dismantling the device.



Figure 7: Non-return Explosion Valve - Q-Flap®Compact (REMBE Inc. 2012.)

4.6 Ball valves

This is an anti-blow-out stem, antistatic valve, design triple stem seals, double body seals, fire-safe design, ISO 5211 drilling for top mounting ($\geq 1\frac{1}{2}$ inches), It has been constructed and tested according to BS 5351/API6D. Its size ranges from 2 inches to 60 inches. (RMT Valvomeccanica Inc. 2012.)



Figure 8: BALL VALVE – TRUNNION MOUNTED SIDE ENTRY – TYPE TSE (RMT Valvomeccanica Inc. 2012.)

5 Import restrictions

Exporting or importing goods is an important aspect in international business, whether the company is large or small. All goods manufactured in one country for the purpose of global sales must move across borders to enter the global distribution channel of the target markets. International trade has rules and regulations, which makes most countries to control the movement of goods across their borders (export/import). For a company to export or import goods, there are a number of barriers involved such as export and import documents, tariffs, quotas and so on. (Cateora, Gilly & Graha 2009, 431.)

Table 3: The exporting process (Cateora, Gilly & Graha 2009, 431.)

Leaving the Exporting Country	Physical Distribution	Entering the Importing Country
Licenses	International shipping and logistics	Tariffs, taxes
General	Packaging	Nontariff barriers
Validated	Insurance	Standards
Documentation		Inspection
Export declaration		Documentation
Commercial invoice		Quotas
Bill of lading		Fees
Consular invoice		Licenses
Special certification		Special certificate
Other documents		Exchange permits
		Other barriers

The most frequently encountered international trade restrictions; beside tariffs are such nontariff barriers (NTB) such as exchange permits, quotas, import licenses, standards, boycotts, and voluntary agreements. (Cateora, Gilly & Graha 2009, 438.)

5.1 Tariffs

These are the taxes or custom duties levied against goods imported from another country. All countries implement tariffs for the purpose of raising capital revenue and protecting home industries from competition against foreign-produced goods. These tariff rates are levied based on either the value or quantity of the goods or both. (Cateora, Gilly & Graha 2009, 438.)

5.2 Exchange permit

These are exchange restrictions placed on the flow of currency by some foreign countries to conserve scarce foreign exchange and alleviate balance-of-payment difficulties. This is done by imposing a restriction on the amount of a country's currency, which they are willing to exchange for another country's currency by rationing the amount of currency available to pay for imports. This is applied to all commodities but some products may have a favorable rate of exchange. (Cateora, Gilly & Graha 2009, 438.)

In countries that uses this method, the usual procedure is very simple but even after receiving this permit, it does not guarantee the seller that he can exchange the local currency for his currency. The usual procedure is for the importer to apply for an import permit to the control agency of the importing country. If approved, an importing license will be issued and should be presented to the proper government agency for currency exchange. (Cateora, Gilly & Graha 2009, 438.)

5.3 Quotas

Quotas are limitation imposed by countries on the quantity of certain goods imported during a specific period of time to protect home companies and products against competition with foreign goods and to conserve foreign exchange. Some countries placed these quotas on goods coming from some specific countries or from all foreign countries in general. (Cateora, Gilly & Graha 2009, 439 - 440.)

5.4 Import licenses

To regulate the flow of currency exchange and quantity of a particular imported commodity, many countries require importing licenses. There is a fundamental difference between quotas and import licenses as a means to control a country's import. This difference is shown by the great flexibility of import licenses over quotas. For example, quotas permit importing until the quota limit is attained where as licensing only limits quantities on a case-by-case basis. (Cateora, Gilly & Graha 2009, 440.)

5.5 Standards

Unlike other nontariff barriers, standards have legitimacy. Implementing product standards such as: health standards, safety standards, product quality standards and so on will protect the consumer public. All imported goods are required to comply with the local laws of the importing country. As a result, these standards turn to slow down import to a point that more time and money is required to comply resulting in trade restrictions. (Cateora, Gilly & Graha 2009, 440.)

5.6 Other restrictions

Some countries on the import of harmful products, drugs, medicines, and immoral products and literature may impose restrictions. Products imported must also comply with government standards set for health, sanitation, environmental protection, packaging and labeling. For example, in Spain, imported condensed milk must be labeled to show fat content if it is less than 8 percent fat. Failure to comply with these restrictions can result in severe fines, penalties, and subsequent delay in clearing customs. (Cateora, Gilly & Graha 2009, 441.)

6 Foreign commercial payments

Selling goods in other countries is a complicated process with a lot of risks encountered when dealing with foreign customers. Some of the risks are; inadequate credit report on customers, currency exchange problems, distance, and different legal systems, as well as the cost and difficulty of collecting delinquent accounts, require a different emphasis on payment systems. (Cateora, Gilly & Graha 2009, 443.) Terms of sales are arranged at the time of the sale between the seller and the buyer and this involve the following considerations; the type of merchandise, amount of money involved, business custom, credit rating of the buyer, and the relationship between the buyer and the seller (whether new or old customer). There are five basic payment arrangements for international sales, namely: letter of credit, bills of exchange, cash in advance, open accounts and forfaiting. (Cateora, Gilly & Graha 2009, 443.)

6.1 Letter of Credit

The buyer in favor of the seller opens a letter of credit shifting the buyer's credit risk to its bank issuing the letter of credit. When a letter of credit is used as a means of payment, the seller ordinarily can draw a draft against the bank issuing the credit and receive euros when presenting a proper shipping document to its bank. Except for cash in advance, letter of credit is a well secure means of payment and has a greater degree of protection for the seller. (Cateora, Gilly & Graha 2009, 443.)

This letter of credit begins with completion of the contract between the seller and the buyer. This contract will state if the letter of credit is revocable or irrevocable meaning that, if the letter is irrevocable, the buyer cannot make any changes once the seller has accepted the letter of credit. But issuing a letter of credit does not guarantee payment since it solely depend on the terms of the letter of credit. For this reason, the seller should ensure that all the terms of sales are met.

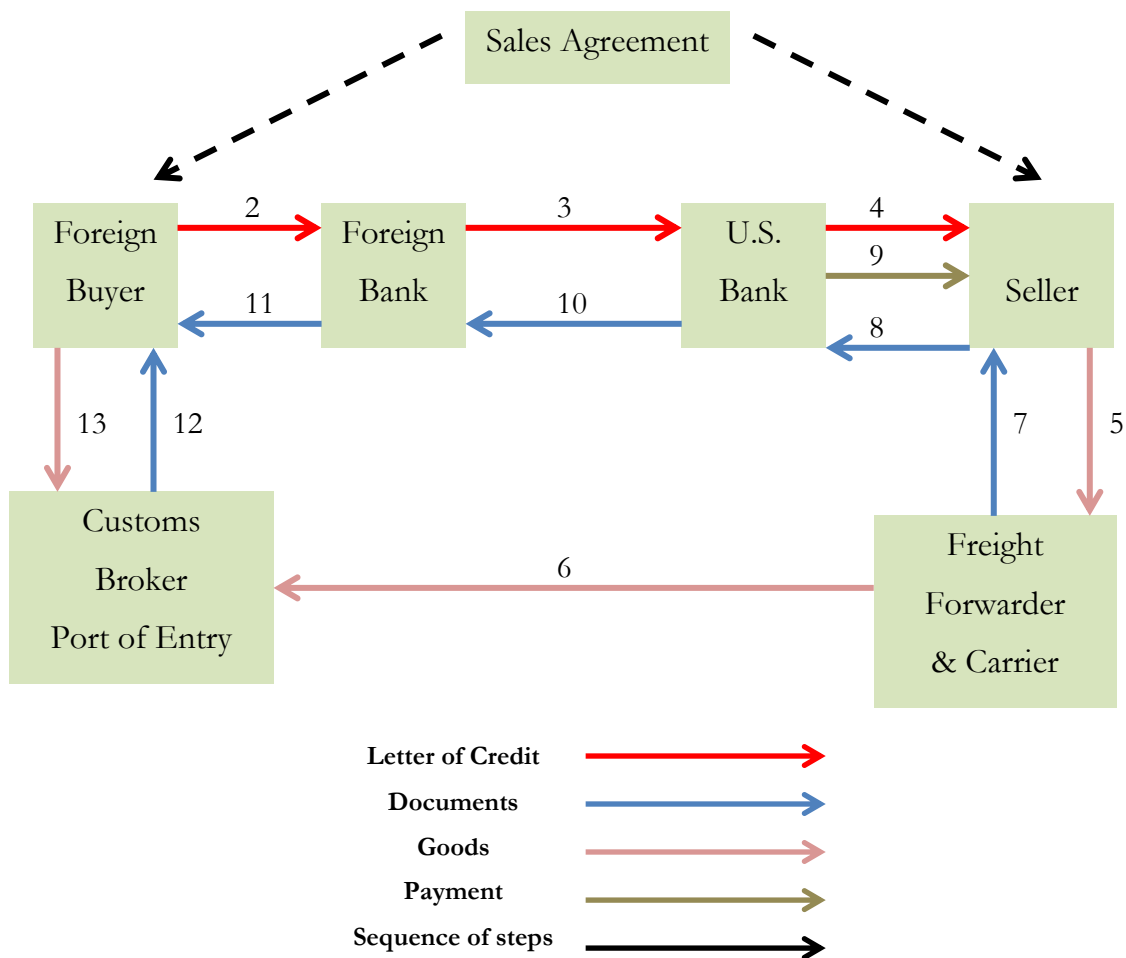


Figure 9: A letter-of-credit transaction (source: Based on “A Basic Guide to Exporting”) (Cateora, Gilly & Graha 2009, 443.)

As shown above, here are the key steps, which take place in a U.S. bank’s irrevocable letter of credit with a foreign bank.

1. Exporter and customer agree on terms of sale.
2. Buyer requests its foreign bank to open a letter of credit.
3. The buyers’ bank prepares an irrevocable letter of credit, including all instructions, and sends the irrevocable letter of credit to the U.S. bank.
4. The U.S. bank prepares a letter of confirmation and letter of credit and sends it to the seller.

5. Seller reviews the letter of credit. If acceptable, arranges with freight forwarder to deliver goods to designated port of entry.
6. The goods are loaded and shipped.
7. At the same time, the forwarder completes the necessary documents and sends documents to the seller.
8. Seller presents documents, indicating full compliance, to the U.S. bank.
9. The U.S. bank reviews the documents. If they are in order, issues seller a check for amount of sale.
10. The documents are airmailed to the buyer's bank for review.
11. If documents are in compliance, the bank sends documents to buyer.
12. To claim goods, buyer presents documents to customs broker.
13. Goods are released to buyer.

(Cateora, Gilly & Graha 2009, 443.)

6.2 Bill of Exchange

With the bill of exchange, the seller of the products is responsible for drawing up a bill of exchange on foreign buyers. It is a risky payment method for the seller until the money is received. If the buyers country rejects the bill of exchange due to the fact that it has exceeded the allowed currency exchange for that month, then this bill of exchange has to wait until the next month. (Cateora, Gilly & Graha 2009, 444.)

The main procedure is for the seller to draw a draft on the buyer in the currency agreed in the order contract and present it with the other necessary documents to the seller's bank for cash collection. The documents required for this process is the same as for letter of credit. (Cateora, Gilly & Graha 2009, 444.) After receiving the draft, the seller's bank forwards it together with the other documents to the buyer's bank in the buyer's home country. The buyer's bank then contacts the buyer for confirmation and payment (either immediate or later). Once the buyer accepts the bill of exchange, the bill of lading is then handed to the buyer, which authorizes the buyer to acquire the goods from the carrier.

6.3 Cash in Advance

Cash in advance is not a growing means of payment by buyers in international business and a large number of buyers reject this method. Cash places a burden on buyers but its typically used when the credit report of the buyer is unknown or doubtful, when currency exchange restrictions may delay return of funds for an unreasonable period, or when the seller for some reason don't want to sell in credit. (Cateora, Gilly & Graha 2009, 445.) Usually, it is agreed on the contract that 25% - 50% should be paid as cash in advance, and most often, this payment is non-refundable and the risk is transferred to the buyer.

6.4 Open accounts

This is not generally made in foreign trade except for customers with long standing relationship and having an excellent credit reputation. It always leaves the sellers in a position where international finance work to their disadvantage.

6.5 Forfaiting

Some sellers avoid the risk of not receiving their payment from international sale where the customers uses inconvertible currencies or may be short in cash to complete the payment on time. Forfaiting is a process where the seller makes an arrangement with a bank or any financial institution to take over the responsibility of collecting the account receivable from a customer. The seller then offers a long financial term with the buyer but intends to sell its account receivable at a discount for immediate cash. Once the account receivable is sold to the forfeiter, the forfeiter assumes all the risks and the basic payment method used is bill of exchange. (Cateora, Gilly & Graha 2009, 445.)

7 Budgeting and transportation mode

In management accounting, Budgeting is the most widely used tool which makes it possible for companies, organizations and governments to plan their resources, in order to make sure that their spending do not get out of control. Budgeting can be defined as the quantitative expression of a plan that helps managers to coordinate and implement their plans. (Braun, Tietz & Harrison. 2010, 475) The budgeting process consists of fixed and variable costs that affects the long and short-term budgeting decisions. The fixed costs are always fixed and it is not a big problem for managers to figure out in their budgeting process, but what they are concerned about are the variable costs. These variable costs includes discretionary spending, such as; machine maintenance, R&D, advertising, and employee training. (Atkinson A, Kaplan R, Matsumura E. & Young S. 2012, 419)

These discretionary cost does not increased the production capacity of a firm but they provide support for organizational strategy by enhancing its performance potential. For example, maintenance increases machine reliability and lowers the lifetime costs of equipment thereby, reducing the overall cost of the firm. (Atkinson A, Kaplan R, Matsumura E. & Young S. 2012, 419). Usually, many companies use their prior year's budgeted figures as their starting point for creating budget for the next operational year, but in this thesis, the author will start with a zero-based budget. Figures of last years budget will only help the author to build up an estimate of what the future budgeting will look like. (Braun, Tietz & Harrison. 2010, 477)

7.1 The master budget

The master budget is a comprehensive planning document which includes all departments in an organization, and this document consist of all of the supporting budgets, which is needed to create the organization's budgeted financial statement. The master budget consists of two parts: operating budget and financial budget. (Braun, Tietz & Harrison. 2010, 479) In this thesis, the author will only prepare a purchasing budget and cash outflow budget for the purchase of spare parts. The master budget illustrated

below is just to show an overview of what a company's entire budgeting should look like.

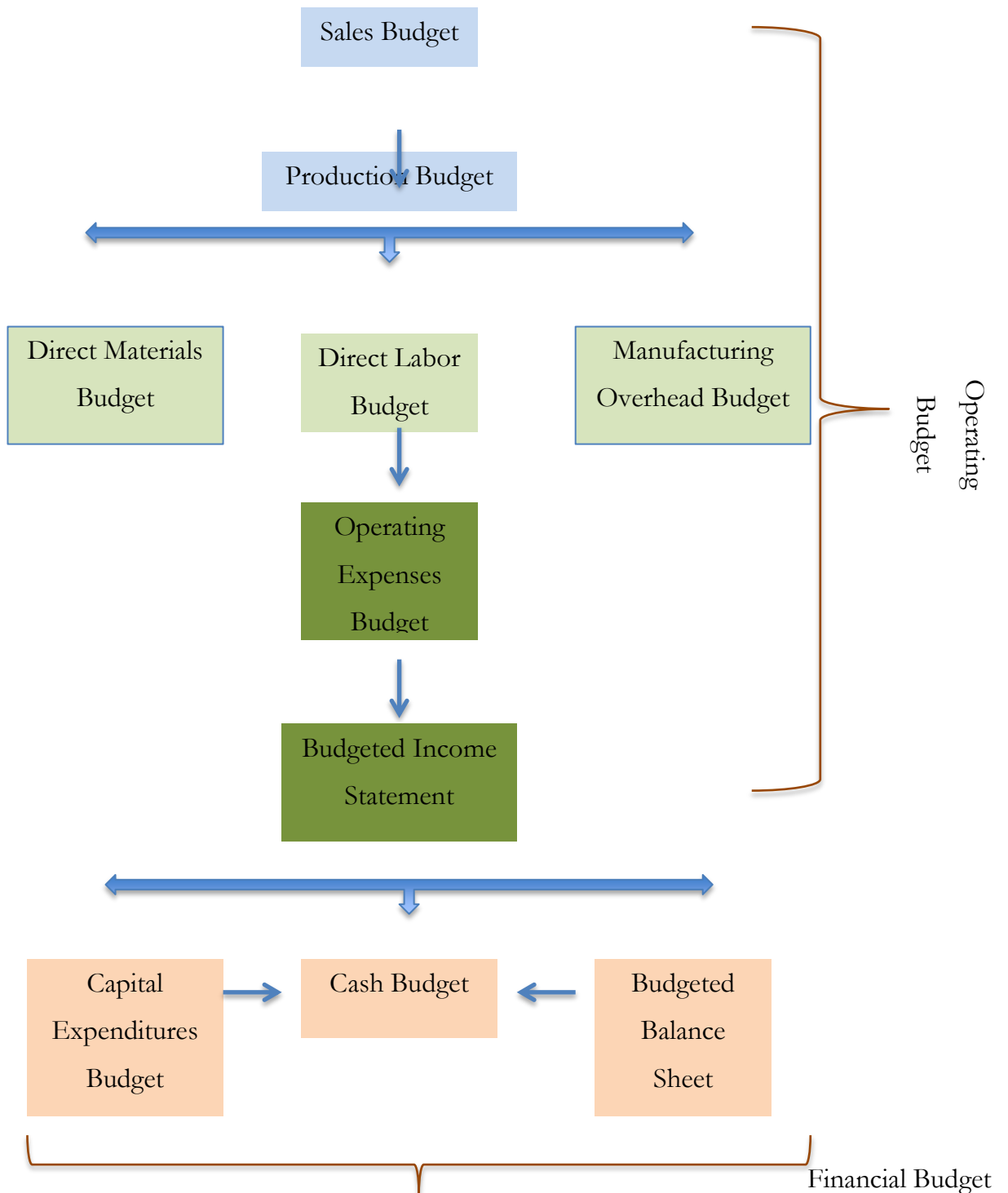


Figure 10: Master Budget for a Manufacturing Company (Braun, Tietz & Harrison. 2010, 481)

7.2 Purchase budget

The purchase budget is a representation of what the company is planning to buy and how much inventory they intend to hold over a given timeframe. This represents the disbursements for purchases that drive the company's cash flows. The purchasing budgets consist of the items to be purchased, total price of these items and total price for the entire purchase.

7.3 Cash outflow budget

The cash payment budget is done depending on the agreement between the supplier and the buyer. This budgeting is done in order for the company to control its cash outflow, short and long-term loan payment. This helps the managers to decide when to pay for spare parts purchase, direct and indirect material purchases, direct and indirect labor costs, manufacturing overhead costs, operating expenses, capital expenditures and income taxes. (Braun, Tietz & Harrison. 2010, 492) In this research, only the cash outflow budget for the purchase of spare parts will be prepared on a quarterly basis for the year 2013.

7.4 Transportation mode

Logistics is of great importance in international trade since goods have to be transported from one country to another. Purchasing from one continent to another has a lot to do with different transportation modes such as road, rail, water and air. For the So.Na. Ra refinery in Cameroon to receive these valves purchased in Europe, it will definitely use the following transportation mode.

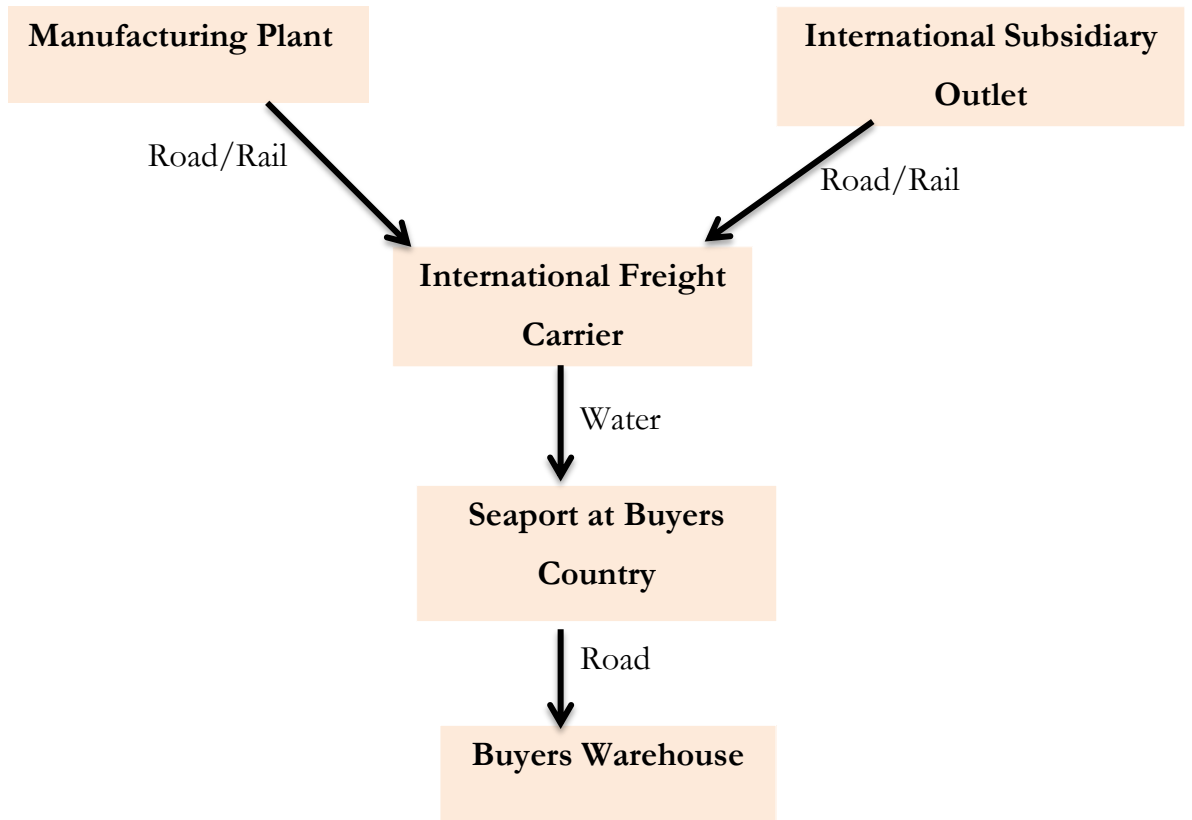


Figure 12: Transportation mode

8 Empirical Research Objective

In this section, the method used will be well elaborated; interview questions and their analysis will be done. All of the accounting calculations will be done and their results analyzed by the author in close collaboration with my substance advisor and commissioning company advisor. The research conclusion and recommendations are made together with the thesis learning process.

8.1 Thesis topic

The thesis topic is financial analysis for international purchase of spare parts by SO.NA.RA refinery.

8.2 Research problem and research questions

The research problem is focused on solving the Cameroon SO.NA.RA refinery's frequent shutdown problems by looking for high quality spare parts and to improve working safety. These shutdowns increase production costs and reduce production efficiency.

How to reduce the cost of machine maintenance in order to avoid frequent production shutdown and improve production efficiency?

The SO.NA.RA refinery in Cameroon is under an expansion project, and by 2015 the company will be able to increase its production from 2.1 million tons per annum to 4 million tons per annum. The company will be able to use the heavy crude oil which is extracted locally to produce finished products, thus the company needs high quality spare parts which can last longer in other for them to achieve all these. Also, in order to achieve all these a number of research questions are considered which are very simple and straightforward. They are listed in a reasonable order from marketing research to costs analysis, as shown below:

1. **Where are the possible suppliers of these spare parts in Europe and how does it affect the cost of maintenance?**
2. **What are the costs of purchasing and transporting these spare parts from Europe to Cameroon? (Preparing a yearly budget)**

The result obtained from this research will help the commissioning company to make a lifetime decision on the purchase of spare parts.

8.3 Research methodology

The research methodology for this research is a **'qualitative method'** because qualitative research seems to promise that we will avoid or downplay statistical techniques and the mechanics of the kinds of quantitative methods used in survey research (Silverman 2005, 6). In case of sufficient resources, many research questions can be thoroughly addressed by combining different methods such as qualitative research to document the detail of say the commissioning company's view on these European suppliers and using quantitative methods to identify statistical variances (by using other customers purchase feedback, questionnaire and statistical survey). (Silverman 2005, 8).

In addition, qualitative research has always had a place in the field of international business, for example, by considering the Uppsala model for firms' internationalization process and regional management, which were typically drawn upon a range of techniques, including qualitative methods, in order to generate theory and new insights. (Marschan-Piekkari & Welch 2004, 5). Moreover, qualitative research is designed to work with relatively small number of research cases; generally speaking, with qualitative research the scope of the research is sacrificed for details. (Silverman 2005, 9). Considering the fact that this is a bachelors' thesis, the author will concentrate on the details obtained from the research questions. By so doing, the author will get closer to the experience leaders whom are not only depending on theories but working and real life business experiences. (Silverman 2005, 10)

8.4 Research method/data collection

As mentioned in chapter 8.3, qualitative research is designed to work with relatively small number of research cases and small amount of data collection, which can be analyzed without using statistical variances with the scope of the research sacrificed for details. (Silverman 2005, 6-10). Therefore, knowing what you want to research on gives a broad idea to the question of how you will get that information. (Miles & Huberman 1984, 42). This leads to some suggestions raised by Miles and Huberman (1984) whom suggested that qualitative researchers have a range of options in how far they use what the authors call 'prior instrumentation' (predefined methods and measures).

When using open questions, exploratory studies need to be less structured than confirmatory studies; if the sample size is very small (such as in this thesis) then cross-case comparison will be more limited and, therefore, the need for standardized research instruments will be less. (Silverman 2005, 110). Therefore, many research methods can be used in research based on either qualitative or quantitative methodologies, with interviews used for 'Survey research': mainly fixed-choice questions to random samples (for quantitative research) and for 'Open-ended' questions to small samples (for qualitative research). (Silverman 2005, 110-111). These open-ended questions gives a better understanding and the interviewees are usually experienced workers such as managers of a department. Thus data collection will be done by performing phone and e-mail interviews with open-ended questions on the following post of responsibility managers:

With the commissioning company, the author will interview the company's Financial Manager and the purchasing Manager. The Financial Manager has all the records of the company's financial situation and transactions. This research is about cost evaluation in order to make a new decision on where the company will purchase its spare parts. He will also give information on how much it cost the company to shutdown its production due to machine failure (manufacturing overhead costs). The purchasing Manager for the commissioning company is in charge of all purchases related to inbound logistics. He will give us information on how much the company purchases spare parts per year. No proper interview will be conducted for the suppliers, but just a request for

spare parts prices and cost of transportation to Hamburg-Germany harbor and the total weight of the products (by e-mail).

8.5 Data analysis

Seeking advice from supervisor is one way of performing a successful data analysis when doing a bachelors thesis. Supervisors are there to offer support when needed especially when a student feels that he is 'drowning in data'. (Silverman 2005, 152). Most importantly, data analysis should not only occur after all data has been collected, performing interviews for a qualitative research entails a small sample group which mean that data analysis can be done after safely collection of data by each interviewee. (Silverman 2005, 152). In addition, each interviewee has a different role to play in the research problem of a qualitative research and their responds can be analyzed independently.

Furthermore, after successful gathering of all of the interviewed questions, it is then very necessary to ask the key question about your data such as: What are the most important questions in your research problem and how do they relate to one another? This means that all questions should fit together in other to have a smooth data analysis process. (Silverman 2005, 153). To have a better understanding of this question, an illustration should be prepared which shows the relationship between research questions and interview theme in order to make sure that all interview questions are related to one another and the research problem.

8.6 Data validity

The validity of this research will depend on the truthfulness of the result, which also rely on the data usefulness. If the commissioning company is unable to use the data then it is invalid. (Silverman 2005, 210). Nonetheless, qualitative researchers, with their in-depth access to single cases (small samples), have to overcome a special temptation of convincing themselves and their audience that their research findings are genuinely (useful) based on critical investigation of their data and do not depend on a few well-chosen research examples? Of course, such challenges to validity are not confined to

qualitative research alone. (Silverman 2005, 211). Thus, the usefulness of these data is what makes it valid.

If we agree the difference of analytic issue in research, the implication might follow that basic requirement for any research study is analytic integrity. This would mean that the validity of a piece of qualitative research could be settled simply by asserting its origin and theoretical roots. (Silverman 2005, 237)

8.7 Research questionnaire

The research questionnaire is performed as an interview; it is very straightforward and only needs information on costs of various issues. It is presented as follows:

For the Purchasing Manager of the commissioning company:

- 1) Which countries in Europe are you interested in buying spare parts from?
- 2) How will the quality of these spare parts affect the company's cost of maintenance?
- 3) What are the estimated quantities of spare parts needed per year (in Euros)?
- 4) What types and quantity of spare parts are needed per year per volume of production (types of spare parts table 4 below)?

Table 4: Quantity of spare parts in relation to volume of production (in tons)

Spare Parts	Quantity in Volume of production /year (in tons)				Quantity in a year (in numbers)
	2.5 tons	3.0 tons	3.5 tons	4.0 tons	
Combustion Valves					
Solenoid Valves					
Digital Pressure /Vacuum Sensors					
Numatics Dryers					
Non-return Ex- plosion Valves					
Ball Valves					

- 5) How many deliveries does the company expect in a year (will need in the future)?
- 6) Please, rate the importance of the delivery time on a scale of 1 to 5 with 1=less important, 2=somewhat important, 3=neutral 4=important and 5=very important.

For the Financial Manager of the commissioning company:

- 7) When is payment for purchases done and how many times in a year?
- 8) What is the cost of manufacturing overhead, due to unexpected machine shutdown?
- 9) How much does the company spend on spare parts per year due to unexpected shutdown?

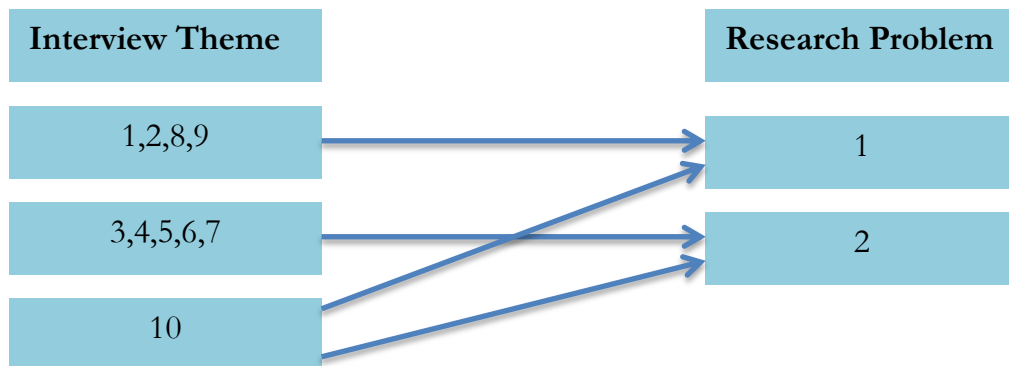
For the Sales Manager of the suppliers:

- 10) What are the weight (valves with the lowest weight), insurance, transportation (to Hamburg-Germany) and price of the following valves?

Table 5: Costs of spare parts per unit, transportation per kilogram and insurance per unit.

Spare Parts	Weight (Kg)	Cost €/Unit	Transportation Cost €/Kg	Insurance Cost €/Unit
Combustion Valves				
Solenoid Valves				
Digital Pressure /Vacuum Sensors				
Numatics Dryers				
Non-return Explosion Valves				
Ball Valves				

Below is an illustration of the relationship between the interview theme and the research problem.



8.8 Demarcation

International purchase is a common phenomenon and buying from European suppliers is a process, which is dying out in Cameroon due to the booming economy of China. Companies are buying cheap and low quality products from China and reject the more expensive and high quality products from Europe and America.

The scope of this research is based on the financial information gathered such as maintenance cost analysis not marketing research. Marketing research is not relevant in

this research, but getting to know these potential spare part suppliers is very vital since all the financial information will be collected from them. The governmental policies for international purchase are irrelevant in this research.

Also, this research will focus on the costs and expenses that are involved in this purchase as well as how it will affect the cost of machine maintenance of the commissioning company. Branding and manufacturer reputation is not considered since it is obvious that manufacturers having a well-known global reputation turn to sell their products at a high price. Meanwhile, there are new manufacturers producing high quality products whose brand names are not globally recognized.

In the beginning of this research, the main scope of the study was to look for suppliers with a high reputation and whose manufacturing factories follow the European Union quality standard. This could not be possible because it needed a lot of time and face-to-face interview. It was also noticed that these suppliers would not want to expose a lot of quality standard confidentiality documents that might expose the suppliers and might jeopardize their business.

Finally, the scope of this research is focused on cost of maintenance in relation to purchasing good quality spare parts with at least one-year warranty. Making the commissioning company the main provider of data for analysis. This thesis will strictly follow theoretical principles and accounting calculations and every calculation will be rounded up to the nearest whole number. If enough resources are available for the author such as face-to-face interview with these suppliers then more detailed analysis will be done otherwise phone and email interviews will be the authors' only source of performing interviews. For a matter of limitations, the author will focus on either one or two suppliers for analysis.

9 Results and analysis

This chapter gives all the detail finding of the interview questions and accounting calculations. The author will use this as the background information needed to make a final decision on the research findings. This chapter will start by analyzing the interview responses, starting with that of the purchasing manager, followed by the financial manager and finally by the suppliers. With this information gathered a cost evaluation would be done in order to get a better understanding of how the cost of machine maintenance is affected.

Attachment 1 is financial and purchasing managers' interview response. Some of the questions were open-ended questions while some were tables that needed simple entries such as cost (€) and weight (Kg). Attachment 2 is the response received from the suppliers. The commissioning company made the interview with the suppliers possible. Four suppliers were contacted but the commissioning company received only two responses after three reminders. For the purposes of limiting the research work and time, analyzing these two supplier responses are sufficient for this research. All interviews were done via email but some clarification with the purchasing manager was done through Skype video call because the author has an intimate relationship with him so he could reserve time for that.

9.1 Purchasing Manager Interview Analysis

The purchasing manager is responsible for purchase of raw materials, finished merchandise intended for resale, spare parts etc. He is the advisor for this research from the commissioning company and he also proposed the research topic for this thesis. This research is important for him to take further decisions on how and where to purchase spare parts for the commissioning company. His responses are analyzed as follows:

- 1) Which countries in Europe are you interested in buying spare parts from?

We are interested in countries within the European Union.

Analysis: Countries within the European Union follow the European quality control system and we assume that their products are high quality products.

- 2) How will the quality of these spare parts affect the company's cost of maintenance?

High quality spare parts last for a longer period of time, if the quality is high enough to last for up to a year without breakdown, then the company won't spend so much money on frequent maintenance of machines, tubbiness etc. If maintenance isn't frequent this will increase production thus, increasing profitability as well.

Analysis: As the quality of these spare parts increases, their efficiency also increases and production of finished products will also increase meanwhile cost of production will decrease. The durability of these spare parts will reduce the cost of maintenance thereby, increasing profitability.

- 3) What are the estimated quantities of spare parts needed per year (in Euros)?

The company budgets 80 million FCFA (€121,959) on all spare parts but this amount is never fixed due to unforeseen circumstances and will increase greatly in the future due to expansion of production and production facilities.

Analysis: This budget is for all spare parts purchased by the commissioning company with raw materials and cost of maintenance excluded. This budget will increase as the SO.NA.RA refinery in Cameroon expands its production in the nearest future.

- 4) What types and quantity of spare parts are needed per year per volume of production (types of spare parts table 4 below)?

SO.NA.RA refinery does not budget spare parts based on production volumes, on the bases of petrochemical valves all we can do is to give an estimated quantity for each type of valve.

Analysis: The purchasing manager made it clear that they do not budget any spare part based on production volume. But on a Skype conversation, he made it known to me that, production volume only affect the amount of raw materials. Some of these raw materials are reactor catalyst, coolant, crude oil etc. (Marshal E. 12.11.2012c).

The following spare parts will be purchased for a period of one year;

1. Combustion Valves – 20
2. Solenoid Valves – 28
3. Digital Pressure /Vacuum Sensors – 24
4. Numatics Dryers – 28
5. Non-return Explosion Valves – 24
6. Ball Valves – 16.

- 5) How many deliveries does the company expect in a year (will need in the future)?

We wish for four deliveries.

Analysis: four deliveries implies four payment for the purchases

- 6) Please, rate the importance of the delivery time on a scale of 1 to 5 with 1=less important, 2=somewhat important, 3=neutral 4=important and 5=very important.

4 (important)

Analysis: The delivery time is important since they might fall short of spare parts. With a Skype interview he also made it clear to me that the company always have spare parts in stock. This is done in order to avoid production shutdown which will seriously damage the company's reputation and make it less competitive in the market(Marshal E. 12.11.2012c).

9.2 Financial Manager Interview Analysis

The financial manager is responsible for all revenue and expenses within the company and he is in a better place to give the author detailed information about the company's financial operations. It was not possible for the author to run a Skype or phone interview with the financial manager but an e-mail interview was done. Due to confidentiality, some of the information requested by the author was not given in order to avoid exposure but information needed for cost analysis were given. The interview analyses are done as follows:

- 7) When is payment for purchases done and how many times in a year?

Payments for purchases are done twice in a year but due to expansion of the refinery, a new decision have been made to increase payment from two to four times in a year. This will be done at the end of the month as follow: March 31, June 30, September 30 and December 31.

Analysis: A cash outflow table will be created and the entries will be done in a quarterly manner on the dates indicated above. If the company has been doing payment for purchases, twice in a year this imply that, they usually purchase their spare parts in bulk and store them in their warehouses.

- 8) What is the cost of manufacturing overhead, due to unexpected machine shutdown?

A yearly average of 4.5 million FCFA (€6,860) cost on manufacturing overhead and if any section of the refinery is shutdown it cost an average of 10 million FCFA (€15,244), which

is lost as revenue due to product shortage in the market. An average of 15 days is recorded in a year for production shutdown of different sections of the refinery.

Analysis: Manufacturing overhead is given as an average because it varies from year to year. As requested by the author, the manufacturing overhead given is as a result of machine and production shutdown. In the company, there are different departments with different overhead cost such as logistics, warehousing and so on. €15,244 indicated as a yearly lost of revenue (sales) which decreases the yearly profit of the company.

- 9) How much does the company spend on spare parts per year due to unexpected shutdown?

This is recorded as miscellaneous expenses and it varies a lot from year to year. An average value for all spare parts needed for production is 1.5 million FCFA (€3,811).

Analysis: The company spends an additional €3,811 last years for purchase of additional spare parts outside the company's' spare parts purchase budget. This is an unexpected expense, which cannot be included in the company's purchase budget.

9.3 ASCO and REMBE valves Inc. interview analysis

This was made possible with the assistance of the commissioning company specifically the purchasing manager. The interview was done by e-mail and it is in a tabular form as follows:

- 10) How long is the product warrantee valid?

Both suppliers gave a period of one year.

Analysis: Since the spare parts can operate for one year without breakdown, then the SO.NA.RA refinery in Cameroon can service its machines once in a year. This will help them save more money on frequent machine maintenance. Servicing of machines will be done no matter the functional situation of the spare parts in order to avoid unexpected breakdown.

11) What are the weight (valves with the lowest weight), insurance, transportation (to Hamburg-Germany) and price of the following valves?

Table 6: Costs of spare parts per unit, transportation per kilogram and insurance per unit for ASCO Valve Inc.

Spare Parts	Product Weight (Kg)	Shipping Weight (Kg)	Cost €/Unit	Transportation Cost €/Kg
Combustion Valves	46.01kg	47.62kg	€2224.79	€1.58
Solenoid Valves	1.6kg	1.95kg	€138.23	€1.58
Digital Pressure /Vacuum Sensors	0.64kg	0.97 Kg	€292.67	€1.58
Numatics Dryers	4.53kg	4.66 Kg	€563.71	€1.58
Non-return Explosion Valves	6.09 Kg	6.13 Kg	€642.26	€1.58
Ball Valves	31.57 Kg	32.06 Kg	€1710.48	€1.58

Table 7: Costs of spare parts per unit, transportation per kilogram and insurance per unit for REMBE Inc.

Spare Parts	Product Weight (Kg)	Shipping Weight (Kg)	Cost €/Unit	Transportation Cost €/Kg
Combustion Valves	42.87 Kg	47.62 Kg	€1880.37	€1.10
Solenoid Valves	0.34 Kg	0.38 Kg	€109.66	€1.10
Digital Pressure /Vacuum Sensors	0.95kg	1.11 Kg	€193.06	€1.10
Numatics Dryers	4.2kg	4.30 Kg	€691.90	€1.10
Non-return Explosion Valves	7.20 Kg	7.36 Kg	€703.10	€1.10
Ball Valves	32.75 Kg	33.48 Kg	€2193.90	€1.10

Analysis: The product weight is the basic weight of the spare parts meanwhile the shipping weight is the weight of the spare parts plus packaging. Cost per unit is the cost for one spare part and the transportation cost is the transportation cost of these spare parts per kilogram to Hamburg-Germany. To get the transportation cost per spare part the transportation cost per kilogram is multiplied by the shipping weight of each spare part. Insurance policy and other liability clauses are agreed upon signing the purchase order and are not considered in this research.

10 Calculations

The calculations are done using basic managerial accounting principles and the tool used is an excel spreadsheet. The author start by calculating the purchase price of these spare parts but only two suppliers will be analyzed, which are ASCO Valves Inc. based in Sweden (Chapter 3.1) and REMBE Inc. based in Germany (chapter 3.2). Both suppliers responded to the interview questions and provided the author with enough information to complete the research for this thesis. Next, is to calculate the transportation cost from these suppliers to Hamburg - Germany (to the international shipping company). Finally, total transportation cost from Germany to Cameroon. Both investigative questions are covered in this chapter but note that chapter 3 covers part of investigative question 1.

10.1 Purchasing cost per supplier

Multiplying the quantity needed in a year with the cost per unit gives the purchasing cost. Both suppliers have different prices for their products and both calculations are done separately.

ASCO valve Inc.

Table 8: Cost of purchasing spare parts from ASCO Valve Inc.

Spare Parts	Cost €/Unit	Quantity in a year (in numbers)	Total Cost / Unit
Combustion Valves	€2,224.79	20	€4,4495.80
Solenoid Valves	€138.23	28	€3,870.44
Digital Pressure /Vacuum Sensors	€292.67	24	€7,024.08
Numatics Dryers	€563.71	28	€15,783.88
Non-return Explosion Valves	€642.26	24	€15,414.24
Ball Valves	€1710.48	16	€27,367.68
Total Cost			€113,956

A quarterly cash outflow budget will be made for these purchases. The yearly quantity of spare parts would be divided by four in order to get the quantity per quarter. This is the total cost when purchasing these spare parts from ASCO Valve Inc. with cost of transportation not included.

REMBE Inc.

Table 9: Cost of purchasing spare parts from REMBE Inc.

Spare Parts	Cost €/Unit	Quantity in a year (in numbers)	Total Cost / Unit
Combustion Valves	€1880.37	20	€37,607.40
Solenoid Valves	€109.66	28	€3,070.48
Digital Pressure /Vacuum Sensors	€193.06	24	€4,633.44
Numatics Dryers	€691.90	28	€19,373.20
Non-return Explosion Valves	€703.10	24	€16,874.40
Ball Valves	€2193.90	16	€35,102.40
Total Cost			€116,661

The total cost of purchasing these spare parts have shown to be different, it may be as a result of either their pricing system, competitive environment, manufacturing cost, quality, brand name and reputation and so on. These differences open another door for further research by the commissioning company.

10.2 Transportation cost per supplier (to Hamburg)

Each supplier will charge differently for transportation per kilogram of each spare part and the mode of transportation will be either rail or road depending on the suppliers' choice. Due to differences in the prices, the total cost will be calculated separately and the delivery is considered just in time for this research. Multiplying the shipping weight by the transportation cost per kilogram gives the total cost of transporting one prod-

uct. Then multiplying it by the quantity of spare parts needed in a year will give the total cost of transporting these spare parts per year. This is shown in the table below.

ASCO Valve Inc.

Table 10: Cost of transporting spare parts from Sweden (ASCO Inc.) to Hamburg-Germany.

Spare Parts	Shipping Weight (Kg)	Transportation Cost €/Kg	Total Cost / Unit	Quantity in a year (in numbers)	Total cost / year
Combustion Valves	47.62kg	€1.58	€75.24	20	€1504.79
Solenoid Valves	1.95kg	€1.58	€3.08	28	€86.24
Digital Pressure /Vacuum Sensors	0.97 Kg	€1.58	€1.53	24	€26.78
Numatics Dryers	4.66 Kg	€1.58	€7.36	28	€206.16
Non-return Explosion Valves	6.13 Kg	€1.58	€9.69	24	€232.45
Ball Valves	32.06 Kg	€1.58	€50.65	16	€810.48
Total Cost			€148		€2867

The total cost to transport these spare parts from Sweden to Hamburg in a year is **€2867**.

REMBE Inc.

A similar calculation is done for REMBE as shown below;

Table 11: Cost of transporting spare parts from REMBE's manufacturing plant to Hamburg-Germany.

Spare Parts	Shipping Weight (Kg)	Transportation Cost €/Kg	Total Cost / Unit	Quantity in a year (in numbers)	Total cost / year
Combustion Valves	47.62 Kg	€1.10	€52.38	20	€1047.60
Solenoid Valves	0.38 Kg	€1.10	€0.42	28	€11.70
Digital Pressure /Vacuum Sensors	1.11 Kg	€1.10	€1.22	24	€29.30
Numatics Dryers	4.30 Kg	€1.10	€4.73	28	€132.44
Non-return Explosion Valves	7.36 Kg	€1.10	€8.10	24	€194.38
Ball Valves	33.48 Kg	€1.10	€36.83	16	€589.23
Total Cost			€104		€2005

The differences in transportation cost is due to the differences in supplier location thus, making the cost higher when transporting goods from Boras in Sweden to Hamburg-Germany.

10.3 Transportation cost to Cameroon (from Hamburg)

The shipping company responsible for transporting these spare parts to Douala – Cameroon is Mokom Auto & Container Shipping. It is based in Hamburg and their postal address is:

Mokom Auto & Container Export

Billwerder Steindamm 26

20537 Hamburg-Germany.

These spare parts will be transported in a secure container that will be about twelve meters high with unspecified length depending on the total area of the spare parts and how they will fit into the container. Mokom Auto & Container Shipping transport cars and other goods from all industries and also provides professional international transportation systems with safe and secure transportation services. (Mokom Auto & Container Shipping, 2012)

They price their customers based on the weight and size of their goods and services. There is a price evaluation service online where you can check the prices of the good you intend to transport by simply selecting your delivery country and the size of your container. In case more information is needed, customers can either call, fax or e-mail the company. For these spare parts, four deliveries will be done in a year in a 40feet standard container. Cost of transportation is **€3,589.38 per delivery** and the mode of transportation is by sea (Mokom Auto & Container Shipping, 2012). This amount covers all the documents needed for shipment with insurance included.

Thus, total cost of shipping these spare parts in a year is given as:

$$4 \times \text{€}3,589.38 = \text{€}14,357.52$$

10.4 Effect on cost of maintenance

Spare parts that can last for more than a year without any functional failure will give a positive impact on the cost of maintenance by reducing the cost of maintenance and increasing the profitability of the company. Also, if the cost of purchasing these spare parts from Europe is more than the cost of maintenance plus the cost of purchasing these spare parts from China, then this will give a negative impact on the cost of maintenance.

This is shown in the table below and all calculations are for one operational year:

Table 12: Purchasing and transportation cost from ASCO Inc. and REMBE Inc. to Cameroon. (Answer to investigative question 2)

	ASCO Inc.	REMBE Inc.
Purchasing Cost	€113,956	€116,661
Transportation to Hamburg	€2867	€2005
Transportation to Cameroon	€14,358	€14,358
Total	€131,181	€133,024

The table above gives the total amount of money needed to buy these spare parts from Europe and delivering them to the buyer at the Douala International Seaport in Cameroon. The slight difference in the total is because each supplier prices their products differently and they are located in different parts of Europe.

To calculate the total cost of maintenance, there are a number of issues to consider. These issues include other operational expenses, which are incurred as a result of machine maintenance. The author takes all these into consideration because, without these machine default, the company would not have spent money or loose sales. All expenses related to the cost of maintenance in a year are shown in the table below:

Table 13: All costs related to cost of maintenance by the SO.NA.RA refinery in Cameroon (Marshal E. 19.11.2012d)

	Cost
Spare parts budget	€121,959
Manufacturing Overhead	€6,860
Decrease in expected revenue	€15,244
Miscellaneous expenses	€3,811
Total Cost	€147,874

All of the entries above are explained in the interview analysis of the commissioning company in subchapters 10.1 and 10.2. It should be noted that some of the costs related to machine breakdown are not included into this calculation in order to make it simple and less time consuming (this is because it will involve other departments in the commissioning company). The Cameroon government owns 66% shares in the company, which makes it free from custom duties and other import charges but not free from VAT and other taxes. VAT and other corporate taxes are implemented only when their finished products are in the market. (Marshal E. 19.11.2012d)

The result above shows that purchasing from both suppliers in Europe has a positive effect on the profitability of the company. Repairs of machines will be done at the appropriate time without incurring any additional cost and other overhead cost will be prevented and the company will be more profitable. From the table 12, it is shown that purchasing from ASCO Inc. is less expensive than purchasing from REMBE Inc. but other factors have to be considered when making a final decision such as quality, economic stability, inflation etc. These differences are shown below (this gives the answer to investigative question 1):

$$\begin{aligned}
 \text{Considering ASCO} &= \text{Total Main. Cost (SO.NA.RA)} - \text{ASCO (cost of purchase)} \\
 &= \text{€147,874} - \text{€131,181} \\
 &= \text{€16,693}
 \end{aligned}$$

$$\begin{aligned}
 \text{Considering REMBE} &= \text{€147,874} - \text{€133,024} \\
 &= \text{€14,850}
 \end{aligned}$$

11 Budget preparation

The budget will be prepared based on purchasing these spare parts from REMBE Inc. in Germany, this is a decision taken by the commissioning company with the reason being that Germany is well known for its economic stability and manufacturing power. They also went through the company introduction and were convinced with what is written about REMBE Inc. Without performing a feasibility study on the quality of the products, the commissioning company admits that, Germans machines last for long and are preferable. (Marshal E. 19.11.2012d). Two budgets will be prepared: purchasing budget and cash outflow budget related to purchases not cost of maintenance or other expenses.

11.1 Purchase budget

The purchase budget is an estimate for future purchases and it only serve as a guide meaning that it is not fixed. Incase of any unforeseen circumstances, changes will be made which might either increase or reduce the budget. The budget is prepared for one operational year as shown below:

Table14: Purchasing budget for the year 2013 (for spare parts bought in Germany)

	REMBE Inc.
Purchasing Cost	€116,661
Transportation to Hamburg	€2005
Transportation to Cameroon	€14,358
Total	€133,024

This budget will increase greatly by 2015 due to expansion of the refinery and the number of deliveries in a year will also increase in order to meet up with the increase in production volume.

11.2 Cash outflow

The cash outflow is done quarterly because there are specific dates for payment of these purchases. These dates are: March 31, June 30, September 30 and December 31. To prepare this, the total cost of purchase for REMBE Inc. is divided by four to make the cash outflow to be in a quarterly expression. The cash outflow is shown in the table below:

Table 15: Cash outflow for purchase of spare parts for the year 2013.

Date of Payment	Quarterly Cash Outflow
March 31	€33,256
June 30	€33,256
September 31	€33,256
December 31	€33,256
Total Payment	€133,024

12 Discussion and conclusion

This chapter will elaborate more on the purpose of the research, the results of the investigative questions, validity of data collected and analysis, then finally suggestions for further research by the commissioning company. As mentioned before, the purpose of this study was to look for European potential suppliers of quality spare parts in order for the company to reduce its cost of machine maintenance. Business is all about making profit and reducing costs. This research cannot be successful without a strong and informative theoretical framework and investigative questions which can guard the author to a better result.

12.1 Summary and interpretation of results

The research started with a marketing research for potential suppliers in the EU, four suppliers were found and most of them have their businesses all over the world with manufacturing plants in Europe. Investigative questions were prepared to guard the author on what to do and how deep he can go. The research work was then demarcated to make it short and simple. Interview questions were prepared for these suppliers and the commissioning company and this interview was done by e-mail. Only two suppliers could answer to these questions and the author analyzed their responses.

Furthermore, a cost analysis of the cost of machine maintenance and all other cost related to it was evaluated and the result was compared to the cost of purchasing these spare parts from ASCO Inc. (based in Sweden) and REMBE Inc. (based in Germany). This finding shows that the commissioning company will save more money when buying from either suppliers in Europe. Moreover, more money will be saved when buying from ASCO Inc. than REMBE Inc. but the commissioning company chooses REMBE Inc. as a preferred supplier due to the economic and industrial stability of the country (GERMANY).

It should be noted that there are other costs related to unexpected machine maintenance which were not included in the calculation and the quantity of spare parts need-

ed is slightly higher than what the company usually purchase. This is because of the expansion in production, which is going on. The tool used for analysis is an excel spreadsheet. A purchase and cash outflow budget was prepared for future use by the commissioning company, which they find useful. The purchase budget is prepared for a year and the entries can be change in case of any increase or decrease in the future.

12.2 Validity of the research

The author was working in collaboration with the commissioning company. If the data is not usable by the commissioning company then it is invalid. (Silverman 2005, 210). Most importantly, without the commissioning company, this research would not have been possible because, the commissioning company sent all of the interview questions and they also sent four reminders to the suppliers. This shows how reliable these responses are and they are 100% valid and useful.

The company advisor for this thesis is the purchasing manager of the commissioning company, and he has been very active in the research. The company needs to make a change in their purchases and Europe is their preferred supplier. The author also emphasize that all of the accounting calculations and principles are valid for this research and have been approved by the commissioning company. Also a final decision will be made when they have their first board of directors meeting early next year 2013.

All of the parties involved in the research are well-experienced employees with good knowledge and managers in their departments. The theories used cover the purpose of the research and the result has been confirmed by the commissioning company.

12.3 Suggestions for further research

The research was well prepared by the author and a lot of challenges were met during the process. In the beginning, it was all about looking for quality products, this required a quantitative survey and the target groups where:

Suppliers – They know more about the quality of their products. This was turned down by the method advisor because it will involve going deep into confidential documents which he said cannot be easily given out.

Commissioning company – To know in detail their present supplier, the quality of the products they buy from them and the cost of these products. This is also seen as a confidential issue because it might destroy their relationship and degrade their current supplier.

Other customers of these suppliers – some customers give a positive feedback on the suppliers' blogs but not all suppliers' websites provide this information making it impossible to analyze.

In general, the following suggestions are made, which will help the commissioning company to take a lifetime decision:

1. A research for the quality of these spare parts should be made in the future; this will help the commissioning company to make a better selection for these spare parts. Durability and usability of these products are the key issues. If they cannot be used for a longer period then there is no need to purchase them. Buying from abroad costs a lot of money for transportation making it costly to return defaulted products to the sellers.
2. The other suppliers whose responses were not received should be contacted again in order to increase the chances of getting a quality and cheaper product. A company like Metso Corporation is a global producer of machines and their spare parts.

12.4 Thesis learning process

However, it was a good experience for the author, starting with thesis preparation workshops in the beginning of the year and presenting the thesis at the end of the year was a lot of time consuming. In the beginning, choosing a thesis topic was a very big

problem since this is the first time for the author to write a thesis. Everything was new; the author did not know what was needed in other to complete a thesis. These workshops help the author to generate the skills needed to write the thesis.

Most importantly, the theoretical framework gave the author a basic understanding of how the research should be conducted. After preparing the questionnaire and receiving the responses, it became clear what the outcome would look like and it was interesting to do the analysis and conclusion. The author found out that cost management is vital for profitability of a company and what we learn in class is not different from everyday work life.

As a whole, the entire thesis writing is beneficial to the author since it was his first experience in working in such a long research involving managers of different companies. Moreover, the author's career plan is to become a manager and this thesis has given him an overview of what his working life will look like.

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Attachment 1. Overlay Matrix

Research Problem (RP.)	Investigative Questions (IQ.)	Theoretical Framework. (The concepts & models)	Data Collection.	Results. (Hypothesis of anticipated results)
How to reduce the cost of machine maintenance in order to avoid frequent production shutdown and improve production efficiency?	Where are the possible suppliers of these spare parts in Europe and how does it affect the cost of maintenance?	3,4	11.4	3.1, 3.2, 3.3, 3.4
	What are the costs of purchasing and transporting these spare parts from Europe to Cameroon? (Preparing a yearly budget)	5, 6, 7, 8	11.1, 11.2, 11.3	12.1, 12.2

Attachment 2. Interview Response

For the Purchasing Manager of the commissioning company:

- 7) Which countries in Europe are you interested in buying spare parts from? *We are interested in countries within the European Union.*
- 8) How will the quality of these spare parts affect the company's cost of maintenance? *High quality spare parts last for a longer period of time, if the quality is high enough to last for up to a year without breakdown, then the company won't spend so much money on frequent maintenance of machines, tubbiness etc. If maintenance isn't frequent this will increase production thus, increasing profitability as well.*
- 9) What are the estimated quantities of spare parts needed per year (in Euros)?
The company budgets 80 million FCFA (€121,959) on all spare parts but this amount is never fixed due to unforeseen circumstances and will increase greatly in the future due to expansion of production and production facilities.
- 10) What types and quantity of spare parts are needed per year per volume of production (types of spare parts table 4 below)?
SO.NA.RA refinery does not budget spare parts based on production volumes, on the bases of petrochemical valves all we can do is to give an estimated quantity for each type of valve.

Table 4: Quantity of spare parts in relation to volume of production (in tons)

Spare Parts	Quantity in Volume of production /year (in tons)				Quantity in a year (in numbers)
	2.5 tons	3.0 tons	3.5 tons	4.0 tons	
Combustion Valves					20
Solenoid Valves					28
Digital Pressure /Vacuum Sensors					24
Numatics Dryers					28

Non-return Ex- plosion Valves					24
Ball Valves					16

11) How many deliveries does the company expect in a year (will need in the future)?

We wish for four deliveries.

12) Please, rate the importance of the delivery time on a scale of 1 to 5 with 1=less important, 2=somewhat important, 3=neutral 4=important and 5=very important.

4 (important)

For the Financial Manager of the commissioning company:

10) When is payment for purchases done and how many times in a year?

Payments for purchases are done twice in a year but due to expansion of the refinery, a new decision have been made to increase payment from two to four times in a year. This will be done at the end of the month as follow: March 31, June 30, September 30 and December 31.

11) What is the cost of manufacturing overhead, due to unexpected machine shutdown?

A yearly average of 4.5 million FCFA (€6,860) cost on manufacturing overhead and if any section of the refinery is shutdown it cost an average of 10 million FCFA (€15,244), which is lost as revenue due to product shortage in the market. An average of 15 days is recorded in a year for production shutdown of different sections of the refinery.

12) How much does the company spend on spare parts per year due to unexpected shutdown?

This is recorded as miscellaneous expenses and it varies a lot from year to year. An average value for all spare parts needed for production is 1.5 million FCFA (€3,811).

Questionnaire for the sales Manager of ASCO Corporation.

12) How long is the product warrantee valid?

One year.

11) What are the weight (valves with the lowest weight), insurance, transportation (to Hamburg-Germany) and price of the following valves?

Table 5: Costs of spare parts per unit, transportation per kilogram and insurance per unit.

Spare Parts	Product Weight (Kg)	Shipping Weight (Kg)	Cost €/Unit	Trans- portation Cost €/Kg
Combustion Valves	46.01kg	47.62kg	€2224.79	€1.58
Solenoid Valves	1.6kg	1.95kg	€138.23	€1.58
Digital Pressure /Vacuum Sensors	0.64kg	0.97 Kg	€292.67	€1.58
Numatics Dryers	4.53kg	4.66 Kg	€563.71	€1.58
Non-return Explosion Valves	6.09 Kg	6.13 Kg	€642.26	€1.58
Ball Valves	31.57 Kg	32.06 Kg	€1710.48	€1.58

Questionnaire for the sales Manager of REMBE Corporation.

13) How long is the product warrantee valid?

Warrantee is valid for one year.

12) What are the weight (valves with the lowest weight), insurance, transportation (to Hamburg-Germany) and price of the following valves?

Table 5: Costs of spare parts per unit, transportation per kilogram and insurance per unit.

Spare Parts	Product Weight (Kg)	Shipping Weight (Kg)	Cost €/Unit	Transportation Cost €/Kg
Combustion Valves	42.87 Kg	47.62 Kg	€1880.37	€1.10
Solenoid Valves	0.34 Kg	0.38 Kg	€109.66	€1.10
Digital Pressure /Vacuum Sensors	0.95kg	1.11 Kg	€193.06	€1.10
Numatics Dryers	4.2kg	4.30 Kg	€691.90	€1.10
Non-return Explosion Valves	7.20 Kg	7.36 Kg	€703.10	€1.10
Ball Valves	32.75 Kg	33.48 Kg	€2193.90	€1.10

