



Pre-feasibility Study

AIR CONDITIONER AND REFRIGERATOR INSTALLATION AND SERVICE CENTER

October 2022

“The figures and financial projections are approximate due to fluctuations in exchange rates, energy costs, and fuel prices etc. Users are advised to focus on understanding essential elements such as production processes and capacities, space, machinery, human resources, and raw material etc. requirements. Project investment, operating costs, and revenues can change daily. For accurate financial calculations, utilize financial calculators on SMEDA's website and consult financial experts to stay current with market conditions.”

Small and Medium Enterprises Development Authority
Ministry of Industries and Production
Government of Pakistan

Table of Contents

1. DISCLAIMER	4
2. EXECUTIVE SUMMARY	5
3. INTRODUCTION TO SMEDA	7
4. PURPOSE OF THE DOCUMENT	7
5. BRIEF DESCRIPTION OF PROJECT & Services	8
5.1. Services	9
5.2. Tools and Equipment.....	13
5.3. Process Flow of A/C and Refrigerator Installation and Service	21
5.4. Installed and Operational Capacities	22
6. CRITICAL FACTORS	27
7. GEOGRAPHICAL POTENTIAL FOR INVESTMENT	27
8. POTENTIAL TARGET Customers.....	27
9. PROJECT COST SUMMARY	28
9.1. Project Economics	28
9.2. Project Cost.....	29
9.2.1 Land	29
9.2.2 Renovation Cost.....	30
9.2.3 Tools and Equipment.....	30
9.2.4 Furniture & Fixtures	31
9.2.5 Office Equipment	32
9.2.6 Office Vehicles.....	32
9.2.7 Pre-Operating Cost.....	33
9.2.8 Security against Building.....	33
9.3. Financial Feasibility Analysis.....	33
9.4. Financial Feasibility Debt Financing.....	34
9.5. Breakeven Analysis	34
9.6. Revenue Generation.....	34
9.7. Variable Cost Estimate.....	40
9.8. Fixed Cost Estimate.....	43
9.9. Human Resource Requirement	43
10. CONTACT DETAILS.....	44
11. USEFUL LINKS	46
12. ANNEXURES.....	47
12.1. Income Statement.....	47
12.2. Balance Sheet	48

12.3. Cash Flow Statement	49
13. KEY ASSUMPTIONS	50
13.1. Operating Cost Assumptions	50
13.2. Revenue Assumptions	50
13.3. Financial Assumptions	50
13.4. Debt related Assumptions	50

Table of Tables

Table 1: Service Capacity Assumptions	23
Table 2: Capacity Calculation - Inverter Air Conditioner Services	23
Table 3: Capacity Calculation – Traditional Air Conditioner Services	24
Table 4: Capacity Calculation – Refrigerator Services	26
Table 5: Project Cost	29
Table 6: Breakup of Space Requirement	29
Table 7: Renovation Cost	30
Table 8: Tools and Equipment Cost	30
Table 9: Furniture & Fixtures	31
Table 10: Office Equipment	32
Table 11: Office Vehicles	32
Table 12: Pre-Operating Cost	33
Table 13: Security against Building	33
Table 14: Financial Feasibility Analysis	33
Table 15: Financial Feasibility Debt Financing	34
Table 16: Breakeven Analysis	34
Table 17: Revenue Generation - Inverter Air Conditioner Services	34
Table 18: Revenue Generation – Traditional Air Conditioner Services	35
Table 19: Revenue Generation – Refrigerator Services	36
Table 20: Bifurcation of Services	36
Table 21: Consumption of Refrigerant	37
Table 22: Revenue Generation – Refrigerant Gas	38
Table 23: Variable Cost Estimate	40
Table 24: Refrigerant Gas Cost	41
Table 25: Fixed Cost Estimate	43
Table 26: Human Resource-Permanent Labor	43
Table 27: Human Resource-Temporary Labor	44
Table 28: Contact Details	44
Table 29: Useful Links	46
Table 30: Operating Cost Assumptions	50
Table 31: Revenue Assumptions	50
Table 32: Financial Assumptions	50
Table 33: Debt Related Assumptions	50

Table of Figures

Figure 1: Gauge Manifold	13
--------------------------------	----

Figure 2: Digital Clamp Multi Meter	14
Figure 3: Nose Plier	14
Figure 4: Screw Driver Set.....	15
Figure 5: Socket Wrench Set	15
Figure 6: L Key Set	16
Figure 7: Mini Gas Welding Machine	16
Figure 8: Welding Torch.....	17
Figure 9: Swaging Tool	17
Figure 10: Level Tool.....	18
Figure 11: Tubing Cutter	18
Figure 12: Manual Tube Bender	18
Figure 13: Drilling Machine	19
Figure 14: Measuring Tape	19
Figure 15: Pipe Cutter	19
Figure 16: Hammer	20
Figure 17: Wire Cutter	20
Figure 18: Pressure Washer.....	20
Figure 19: Refrigerant Gas Cylinder	21
Figure 20: Service Process Flow	21
Figure 21: Refrigerator Market Revenue.....	28

1. DISCLAIMER

This information memorandum is to introduce the subject matter and provide a general idea and information on the said matter. Although, the material included in this document is based on data / information gathered from various reliable sources; however, it is based upon certain assumptions, which may differ from case to case. The information has been provided on, as is where is basis without any warranties or assertions as to the correctness or soundness thereof. Although, due care and diligence has been taken to compile this document, the contained information may vary due to any change in any of the concerned factors, and the actual results may differ substantially from the presented information. SMEDA, its employees or agents do not assume any liability for any financial or other loss resulting from this memorandum in consequence of undertaking this activity. The contained information does not preclude any further professional advice to be obtained by the users. The prospective user of this memorandum is encouraged to carry out additional diligence and gather any information which is necessary for making an informed decision, including taking professional advice from a qualified consultant / technical expert before taking any decision to act upon the information.

For more information on services offered by SMEDA, please contact our website:

www.smeda.org.pk

Document Control

Document No.	273
Prepared by	SMEDA-Punjab (OS)
Revision Date	October 2022
For information	helpdesk.punjab@smeda.org.pk

2. EXECUTIVE SUMMARY

Air Conditioners (AC) and Refrigerators are very important home appliances, used in most of the households all around the world. In order for them to operate efficiently over longer periods of time, they require regular servicing, repair and maintenance.

An air conditioner provides cool air inside an enclosed space by removing heat and humidity from the air. Air conditioners come in a variety of shapes and sizes, but all types of air conditioners operate on the same basic principle. Installation of ACs is a very important job, since correct installation ensures optimal cooling, whereas incorrect installation affects the cooling efficiency and may also damage the AC. A poor installation may also lead to more frequent maintenance problems and higher electricity consumption, leading to higher bills.

AC manufacturers recommend seasonal cleaning and periodic maintenance to enhance its life and improve its cooling efficiency. Regular AC servicing boosts its performance and reduces electricity bills. An AC, not serviced regularly, consumes more power and/or may provide less cooling due to reasons such as gas or water leakage.

A refrigerator is an appliance that removes heat from a closed space to decrease its inner temperature, allowing food and other items to be stored at a cool temperature inside the refrigerator. Storing food in the refrigerator helps preserve it over longer periods of time. Refrigerators are very commonly used in houses, hotels, restaurants, hospitals, and offices. Refrigerator normally keeps running round the clock to keep the stored food products fresh. That is why it is important to get a refrigerator repaired quickly whenever it works inefficiently or stops working. Usually, a refrigerator needs repairing because of lowering of its cooling deficiency. Other most common repair issues include an out-of-order ice maker, gas leakage and any unusual noise.

The importance of ACs and refrigerators in everyday life is very high. Therefore, professional and timely repair services of AC and refrigerator have become very important. This “Pre-feasibility Document” provides details for setting up an Air Conditioner and Refrigerator Installation and Service Center. It may be established in any city of Pakistan due to common use of ACs and refrigerators in households and commercial places.

The proposed project has maximum annual capacity of providing 12,140 number of services which includes 4,464 number of services for inverter air conditioners, 2,976 number for services of non-inverter air conditioners and 4,700 number of services for refrigerators. It is assumed that the business will be able to attain 50% capacity utilization during first year of operations providing total of 6,073 number of services which includes 2,232 number of services for inverter air conditioners, 1,491 number of services for simple air conditioners and 2,350 number of services for refrigerators.

The “Air Conditioner and Refrigerator Installation and Service Center” will be set up in a rented area of 1,126 square feet. The project requires a total investment of PKR 3.46 million. This includes capital investment of PKR 2.88 million and working capital of

PKR 0.58 million. This project is financed through 100% equity. The Net Present Value (NPV) of project is PKR 15.96 million with an Internal Rate of Return (IRR) of 80% and a Payback period of 1.92 years. Further, this project is expected to generate Gross Annual Revenues of PKR 11.95 million during 1st year, with Gross Profit (GP) ratio ranging from 40% to 62% and Net Profit (NP) ratio ranging from 7% to 35% during the projection period of ten years. The proposed project will achieve its estimated breakeven point at capacity of 39% (4,793 No. of services) with annual breakeven revenue of PKR 9.433 million.

The proposed project may also be established using leveraged financing. With 50% debt financing, at a cost of KIBOR+3%, the proposed production unit provides Net Present Value (NPV) of PKR 18.91 million, Internal Rate of Return (IRR) of 78% and Payback period of 2.02 years. Further, this project is expected to generate Net Profit (NP) ratio ranging from 6% to 35% during the projection period of ten years. The proposed project will achieve its estimated breakeven point at capacity of 40% (4,868 No. of services) with breakeven revenues of PKR 9.58 million.

The proposed project will provide employment opportunities to 12 people. High return on investment and steady growth of business is expected with the entrepreneur having some prior experience similar businesses. The legal business status of this project is proposed as "Sole Proprietorship". Further, the proposed project may also be established as a "Partnership Concern".

3. INTRODUCTION TO SMEDA

The Small and Medium Enterprises Development Authority (SMEDA) was established in October 1998 with an objective to provide fresh impetus to the economy through development of Small and Medium Enterprises (SMEs).

With a mission "to assist in employment generation and value addition to the national income, through development of the SME sector, by helping increase the number, scale and competitiveness of SMEs", SMEDA has carried out 'sectoral research' to identify policy, access to finance, business development services, strategic initiatives and institutional collaboration and networking initiatives. Preparation and dissemination of prefeasibility studies in key areas of investment has been a successful hallmark of SME facilitation by SMEDA.

Concurrent to the prefeasibility studies, a broad spectrum of business development services is also offered to the SMEs by SMEDA. These services include identification of experts and consultants and delivery of need-based capacity building programs of different types in addition to business guidance through help desk services.

National Business Development Program for SMEs (NBDP) is a project of SMEDA, funded through Public Sector Development Program of Government of Pakistan.

The NBDP envisages provision of handholding support / business development services to SMEs to promote business startup, improvement of efficiencies in existing SME value chains to make them globally competitive and provide conducive business environment through evidence-based policy-assistance to the Government of Pakistan. The Project is objectively designed to support SMEDA's capacity of providing an effective handholding to SMEs. The proposed program is aimed at facilitating around 314,000 SME beneficiaries over a period of five years.

4. PURPOSE OF THE DOCUMENT

The objective of the pre-feasibility study is primarily to facilitate potential entrepreneurs in project identification for investment. The project pre-feasibility may form the basis of an important investment decision and in order to serve this objective, the document/study covers various aspects of project concept development, start-up, and production, marketing, finance and business management.

The purpose of this document is to provide information to the potential investors about "Air Conditioner and Refrigerator Installation and Service Center". The document provides a general understanding of the business to facilitate potential investors in crucial and effective investment decisions.

The need to come up with pre-feasibility reports for undocumented or minimally documented sectors attains greater imminence as the research that precedes such reports reveal certain thumb rules; best practices developed by existing enterprises by

trial and error, and certain industrial norms that become a guiding source regarding various aspects of business setup and its successful management.

Apart from carefully studying the whole document one must consider critical aspects provided later on, which form the basis of any investment decision.

5. BRIEF DESCRIPTION OF PROJECT & SERVICES

The proposed project will provide installation services for air conditioners (AC) and repair & maintenance services for both ACs and refrigerators. Air conditioners and refrigerators require regular maintenance services to function effectively and efficiently throughout their years of service. Getting installation, repair and maintenance from untrained people leads to damaging the appliances, reduces their lives and increases the operational costs. Therefore, engaging professionally trained, expert personnel for getting these services is very important.

There are several types of ACs such as split-system, packaged, ducted, multi-split air conditioners, etc. The most common and in-demand ACs used in homes and offices are split-system air conditioners. Air conditioners are called "split-systems" because the air-cooled condensing unit called the compressor unit is placed outside the air-conditioned area whereas the air-handling unit (blower) is inside the room. These two systems work together to accomplish the task of cooling an interior space while also dehumidifying it. This dehumidification happens as warm air from inside passes over the cold evaporator, where the moisture in the air condenses and is removed.

Split-system ACs are of two types i.e., inverter ACs and simple traditional ACs. An inverter is a technology that saves energy in air conditioners by efficiently controlling the motor speed of the compressor. Motor speed in simple traditional air conditioners remains constant and temperature is adjusted by turning the motor on and off, which consumes more electricity. In inverter type ACs, the temperature is adjusted by changing motor speed without turning the motor on and off, which leads to less consumption of electricity. Compared to simple traditional ACs, the ACs with inverter technology consumes less power and hence saves energy. Moreover, the inverter ACs also offer a heating mode which allows the consumers to use these appliances in winter as well, in place of heaters. They are energy efficient compared to other heating devices. In the proposed project, services for both types of split-system ACs are being provided.

Refrigerators keep food and drinks cool, by pushing a liquid refrigerant through a sealed system, which causes it to vaporize and draw heat out of the fridge. The vaporized refrigerant is then passed through coils outside the fridge. This warms up the vapor and changes it back into a liquid, and the same process is then repeated again and again.

Since a fridge stays effective and functional round the clock, the need for its repair and maintenance is expected to keep arising from time to time. A faulty refrigerator need

to be fixed quickly to restore the option of food storage. Hence, there arises the need for professional refrigerator repair services. Some common problems in refrigerators are, water or gas leakage, a nonoperational freezer not producing ice, less or no cooling, loud noises from the machine, etc.

In the proposed ACs and Refrigerator Installation and Service Center, 2 technicians for inverter ACs, 2 technicians for simple traditional ACs and 2 technician for refrigerators have been proposed as the key service providers. As the inverter ACs are also used in winter, the technicians of inverter ACs and the technician of refrigerator will be part of the permanent staff throughout the year. Whereas, the technicians of simple traditional ACs will be temporary staff working for 8 months a year from March to October (inclusive). As the simple traditional ACs are not used in winter, there is no market demand for their repair and maintenance services.

Furthermore, if any spare parts would be required for any of the repair services they would be paid for by the client. The client will procure the required spare part or technician may offer to procure the spare parts on behalf of the client from market as it is a market norm to do so. As the technicians have a better understanding of which spare part to buy and of which quality.

Normally, in these types of service centers, clientele is built through word-of-mouth marketing i.e., the existing clients introducing and suggesting the service provider to their friends, relatives and other acquaintances. In recent times, these types of service centers have also been inclined towards digital marketing to increase their clientele.

5.1. Services

The services provided by the proposed business are briefly explained below:

AC Services

AC General Service

During AC general service, the technician cleans the dust and debris from the condenser coil and evaporator coil and other key components in both the indoor and the outdoor units. General Service of an AC is done while the AC is still mounted on the wall.

AC Master Service (Remove Units to Clean)

For the AC master service, it is uninstalled first to perform proper cleaning with the help of a pressure wash of indoor and outdoor units and the AC filter.

Installation of Air Conditioner

Proper Installation of air conditioner is an important element for its proper functioning. Air conditioner is installed on a strong wall. Mounting plate is fixed against the wall where the AC is to be mounted. A hole of about 7-8 cm is drilled in an appropriate position for the pipes to and wire to go out to the outdoor split unit. The indoor unit is fitted with the mounted plate and, the pipe and wire are passed through the hole.

Brackets are fixed with the help of fasteners. The outdoor of the air conditioner is fixed on the bracket. The AC outdoor is bolted up with the bracket firmly. Wires and copper pipes from the indoor unit are connected with the outdoor unit of the air conditioner. Generally, air conditioners are installed with 10 feet and 30 feet pipes.

Uninstalling

Mostly, uninstalling service is required by people who are shifting from their homes or offices or by the people intending to replace their old ACs with new ones. To avoid any damages to the AC unit, uninstallation of AC should ideally be performed by a technician. Normally, to avoid any risks, two people are required for this process as the outdoor unit of a split AC is heavy. Firstly, the power supply is turned off and a bucket is normally put underneath the inner unit to catch any refrigerant or water spill. Then the pipes and wires connecting the inner and outdoor unit are removed and then the inner and outdoor unit of the AC is unmounted.

Gas Leakage Repair

Every AC unit needs refrigerant gas for its efficient working. The refrigerant is a low-pressure gas which transforms into liquid and again gets converted into gas during a constant cyclic process.

Two different types of refrigerants are used for inverter AC and simple AC. The refrigerant used for inverter AC in the market is commonly known as R-410A. It is a member of hydrofluorocarbon (HFC) class of refrigerants. These refrigerants consist of hydrogen, fluorine and carbon. The refrigerant used for simple traditional AC in the market is commonly known as R-22. It is a member of hydrochlorofluorocarbon (HCFC) class of refrigerants. These refrigerants consist of hydrogen, chlorine, fluorine and carbon. The refrigerant gas quantity/weight required to completely fill an AC without any gas already present are as follows for different ACs:

- 1 Kg for 1 Ton Air Conditioner
- 1.4 Kg for 1.5 Ton Air Conditioner
- 2.5 Kg for 2 Ton Air Conditioner
- 4 Kg for 4 Ton Air Conditioner

These quantities/weights are same for both types of gases i.e., R-22 and R-410A.

Refrigerant gas leakage is a very common problem in split AC units. One of the most common reasons for AC gas leak is corrosion or presence of holes in the pipes. Proper soldering is performed by the technicians to repair or prevent any more gas leakage from any such holes.

Gas Re-Filling

The refrigerant gas refilling is a complex procedure and hence needs to be performed by a technician. A suction line present in the outdoor unit of a split AC is used for

refilling of refrigerant gas into the AC. According to market response, on average 40% of total gas capacity is to be refilled in the air conditioners.

AC Water Leak

Mostly water leakage in ACs is a result of dust and debris accumulating in the condensate drain line, causing a blockage/clog. This leads to the water backing up and eventually leaking. The same problem can happen with the drain pan to cause a water leakage issue in the AC. The technician diagnoses the reason of leakage and clean out the dust and debris to prevent any further leakage or this fault may require changing of the damaged pipe.

AC Trip Issue

There can be several reasons leading to an AC trip issue such as a loose wire or connection, power surge, a failed capacitor or compressor, clogged air filter, dirty condenser coil or fan motor malfunction. All such issues require a technician's services to be resolved.

Fan Motor Replacement

The fan motor is a vital part that must be running well for an AC unit. It is necessary for moving hot air outside of the walls, as well as blowing cool air through the pipe into the rooms. Following signs indicate that the fan motor may be out of order and needs to be replaced by a technician:

- The cooling fans do not turn on
- When AC is running but the blades rotate slowly
- Rattling noise is produced by the unit
- Burning smell is detected

Refrigerator Services

Refrigerant/Coolant Gas Leakage Repair or Refilling

The refrigerant/coolant is a gas at atmospheric pressure. The refrigerant used in refrigerator currently in the market is normally known as R-134A. It is a member of hydrofluorocarbon (HFC) class of refrigerants. These refrigerants consist of hydrogen, fluorine and carbon. When compressed, it heats up as all gases do. It is then fed to a radiator outside the fridge, called the condenser where it cools and condenses, turning it into a liquid at high pressure. Then, the liquefied gas is fed to the loop going through the interior chambers of the fridge.

The refrigerant does not leak out in normal course. However, if cooling effect is reducing, after checking the thermostat, the refrigerant is also inspected by the technician for any leakages. Different service charges are charged for leakage repair and re-filling of refrigerant gas.

The refrigerant gas's quantity/weight required to completely fill a refrigerator without any gas already present in it is 0.4 Kg.

Replacing/Repairing Thermostat

The thermostat in a refrigerator is designed to regulate temperature to chill food and beverages. If the stored items do not seem as cool as they should be, there is a chance of a malfunction in the thermostat. The technician then has to inspect and decide whether to repair that thermostat or replace it with a new one.

Replacing/Repairing Faulty Compressor

The compressor is the main part of any refrigerator. It circulates the refrigerant throughout the system. Some of the signs of a faulty compressor include higher electricity consumption than usual, more noise than usual from refrigerator, circuit breaker trips or noticing a burning smell. If any of these signs appear the compressor needs to be repaired or replaced.

Relay Change

Relay is an electronic component which helps compressor of a refrigerator to start. A faulty relay can damage a compressor or can also cause a short circuit in wiring. It needs to be replaced for the refrigerator to start working properly again.

Fan Change

An evaporator fan in a refrigerator is responsible for cooling the refrigerator. It is located on the back wall of the freezer and pulls air through the condenser coils. The fan blows cool air throughout the fridge. It also helps to remove moisture from the air, which prevents ice buildup on the evaporator coils. The evaporator fans often make more noise than usual when they start to go bad. The compressor keeps on running but the refrigerator does not cool which means that the fan needs to be changed immediately.

Electrical Cord Repair or Change

A refrigerator electrical cord is a heavy-duty cord with a three-prong plug, two electrical prongs and a ground prong. Although replacement cords are available, in many cases it may be more efficient and cost effective to just repair the part of the cord that has been affected.

Water Leakage Repair

Usually, water leakage happens when food particles or other debris clog up the drain hose, which can lead to ice buildup and, eventually, water leaking out of the freezer and refrigerator.

5.2. Tools and Equipment

The tools required by the technicians in the proposed project are briefly described below:

Gauge Manifold

A manifold gauge is a must-have tool in any AC technician's toolkit that measures pressure changes in gases and liquids such as air conditioning refrigerants. The refrigerant's temperature and pressure are displayed on the manifold's gauge, which can then be used to diagnose problems with the AC unit. Figure 1 shows a gauge manifold.

Figure 1: Gauge Manifold



Digital Clamp Multi Meter

The digital clamp multimeter is a device that can measure voltage, current, and resistance. It has an LCD display that shows the results of the measurements taken by the tool in numerical form. Digital multimeters are used to test electrical circuits for continuity (whether they are open or closed), as well as other tests such as measuring AC/DC current and voltage levels. While servicing an Air conditioner, a digital clamp multi meter is used to check the ampere and voltage reading. Figure 2 shows a digital clamp multi meter.

Figure 2: Digital Clamp Multi Meter**Nose Pliers**

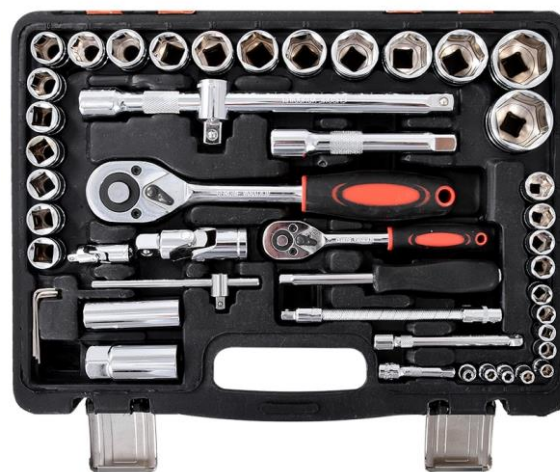
A pliers is a tool that is used to grip or hold objects. There are many different types of pliers available, each with its own unique purpose. Nose pliers is a type of pliers that has a long, thin nose. It is ideal for gripping small objects such as wires or screws. This is a very common tool and is generally used to remove the outer covering of wires. It is an essential tool for servicing air conditioners. Figure 3 shows a nose pliers.

Figure 3: Nose Plier**Screw Drivers Set**

Screw drivers are used to tighten or loosen screws, nuts, bolts and other fasteners. They can also be used for removing panels or covers and prying objects open. They come in many different sizes, shapes and types to accommodate various tasks. A typical simple screwdriver has a handle and a shaft, ending in a tip the user puts into the screw head before turning the handle. A screw driver set consists of screw drivers of different sizes for screws of different sizes. Figure 4 shows a screw driver set.

Figure 4: Screw Driver Set**Socket Wrench Set**

A wrench is a tool used to tighten or loosen nuts and bolts. It has an adjustable jaw that can be moved up and down, so the size of the nut/bolt head it fits over changes accordingly. Socket wrenches are perfect for turning bolts or nuts using a ratchet handle. Figure 5 shows a socket wrench set.

Figure 5: Socket Wrench Set**L-Keys Set**

The L-keys set is a collection of hex keys that are in the shape of 'L'. These keys come in different sizes and shapes and are used to tighten and loosen bolts and screws with hexagonal sockets in them. Figure 6 shows a L-keys set.

Figure 6: L Key Set

Mini Gas Welding Machine

A mini gas welding machine is a small portable and easy-to-use tool that uses oxygen as fuel for cutting metal with an electric arc. It is perfect for welding and repairing thin sheet metal and because it is small and lightweight, it can be easily transported to the job site. Figure 7 shows a mini gas welding machine.

Figure 7: Mini Gas Welding Machine

Welding Torch

A torch is another essential tool for air conditioner technicians. A torch is a handheld device that uses an open flame to heat up metal parts so that they can be welded or soldered together. Figure 8 shows a welding torch.

Figure 8: Welding Torch**Swaging Tool**

A swaging tool is a device that crimps or deforms metal tubing so that it forms a tight seal. It is often used in plumbing applications to join two pieces of copper pipe together without using solder. In AC servicing, it is mostly used in connecting two copper pipes together by increasing the hole size of a copper pipe. Figure 9 shows a swaging tool.

Figure 9: Swaging Tool**Level Tool**

Level tool is used to determine the horizontal and vertical level of the surface during installation of air conditioner. Figure 10 shows a level tool.

Figure 10: Level Tool***Tubing Cutter***

A tubing cutter is a tool that cuts copper brass and other types of tubing uniformly. It has two sharp blades on one side which slice through material while an adjustable wheel allows for precise measurements to ensure proper fitting after cutting. Figure 11 shows a tubing cutter.

Figure 11: Tubing Cutter***Manual Tube Bender***

A tube bender is a device that bends metal tubes into different shapes and angles without causing any damage or distortion to them during operation. AC technicians use this tool to bend the copper pipes while installing air conditioner or repairing an air conditioner or refrigerator. Figure 12 manual tube bender.

Figure 12: Manual Tube Bender

Drill Machine

A drill machine is a handheld tool that uses a rotating bit to create holes. It comes with different sized bits for drilling various hole sizes. Figure 13 shows a drilling machine.

Figure 13: Drilling Machine

**Measuring Tape**

A measuring tape is a long strip of plastic with markings at intervals along its length to measure distances accurately. It is usually marked in both inches and centimeters. Figure 14 shows a measuring tape.

Figure 14: Measuring Tape

**Pipe Cutter**

A pipe cutter is a powerful tool that is used to cut pipes. It has two sharp blades. The blade also includes an integrated handle which makes it easy to use without hurting one's hands during operation. Figure 15 shows a pipe cutter.

Figure 15: Pipe Cutter



Hammer

Hammer is a tool used to fasten or remove nails. It is used in installation of ACs. Figure 16 shows a hammer.

Figure 16: Hammer

***Wire Cutter***

Wire cutter is a tool, designed to properly cut the wire, with minimal damage to the insulation or internal conductors of the wire. A clean cut on a wire can improve the quality of an electrical connection. Figure 17 shows a wire cutter.

Figure 17: Wire Cutter

***Pressure Washer 105 Bar***

Pressure washer uses a narrow, high pressure of water to remove the dirt from any surface. The high pressure of water hits the surface with high kinetic energy, knocking dirt and dust away. Figure 18 shows a pressure washer.

Figure 18: Pressure Washer



Refrigerant Gas Cylinder

Refrigerant gas cylinder is used to store and transport refrigerant gas to customer premises for filling refrigerant into air conditioners. The weight of the cylinder is 2.5 kg and have gas storage capacity of 9.5 kg. Figure 19 shows refrigerant gas cylinder.

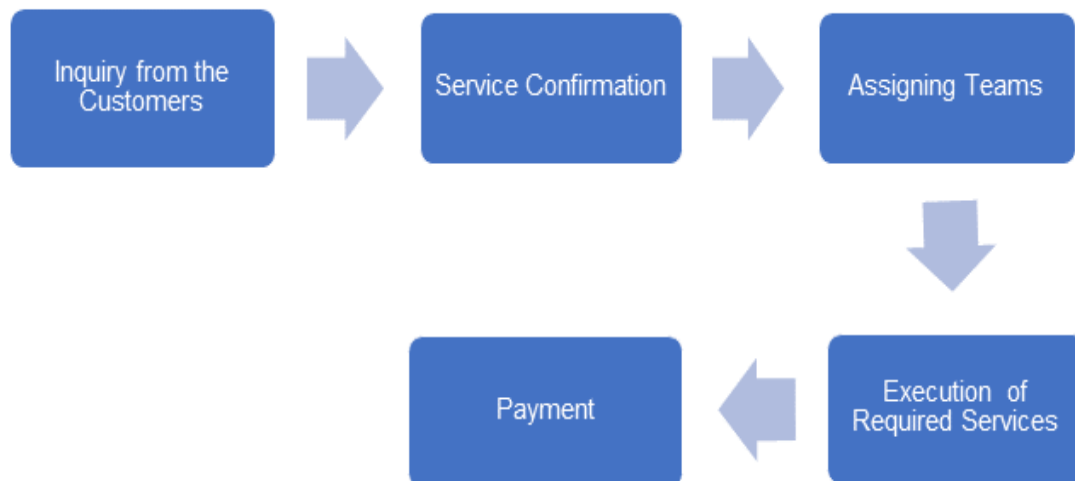
Figure 19: Refrigerant Gas Cylinder



5.3. Process Flow of A/C and Refrigerator Installation and Service

The service process flow is shown in Figure 20.

Figure 20: Service Process Flow



Inquiry from the Customers

In this step, customers reach the business through call, website or by physically visiting the business premises. The customer is inquired about the kind of services he needs. According to the customer's problem, the business representative advises the customer on the problem and recommends the appropriate service. The customer is also informed about the cost of the required service.

Service Confirmation

After acquiring the essential information, the customer confirms the order for the related service.

Assigning Teams

Three types of teams are available in the proposed business (team for inverters air conditioner, simple air conditioner and refrigerators). The supervisor appoints teams according to the type of service requested by the customer. The relevant team is mobilized and sent to the customer's premises where it performs the requested services.

Execution of Required Services

The designated team arrive at the customer's premises and determines the primary source of the problem. The technician fixes the problem by applying the proper techniques. In case some parts have to be replaced, the customer is informed about those and upon his consent, the parts are also replaced. The technician performs a final check on the appliance to ensure that the problem is resolved. In certain cases, the nature of the problem requires the appliance to be brought to the workshop. This is done with the consent of the customer and agreeing on the payment of costs associated with this activity.

Payment

The customer verified that the service is accomplished after which the customer pays the technician. No credit is allowed to the customer.

5.4. Installed and Operational Capacities

The proposed center will have maximum annual capacity of Providing 12,140 number of services which includes 4,464 number of services for inverter air conditioners, 2,976 number for services of traditional air conditioners and 4,700 number of services for refrigerators. It is assumed that the business will be able to attain 50% capacity utilization during first year of operations providing 6,073 number of services which includes 2,232 number of services for inverter air conditioners, 1,491 number of services for simple air conditioners and 2,350 number of services for refrigerators. The operational capacity utilization is assumed to increase at the rate of 5% per annum to reach a maximum of 95% in year 10. Table 1 shows service capacity assumptions. Table 2, Table 3 and Table 4 show capacity calculations of inverter air conditioner, traditional air conditioner and refrigerator.

Table 1: Service Capacity Assumptions

Particulars	No. of Skilled Workers	Hours Available Per Day Per Worker	Working Days Per Year	Total Skilled Hours Available
Inverter Air Conditioner Installation and Service	2	10	300	6,000
Traditional Air Conditioner Installation and Service	2	10	200	4,000
Refrigeration Service	2	10	300	6,000

Table 2: Capacity Calculation - Inverter Air Conditioner Services

Particular	Service Ratio	Total Working Hours Available per Year	Service Hours per Year	Time Required per Service (Hours)	No. of Services in a Year @ 100% Capacity	No. of Services in a Year @ 50% Capacity
Formulas	<i>A</i>	<i>B (Table 1)</i>	$C=A*B$	<i>D</i>	$E=C/D$	$F=E*50\%$
Ac General Service 1-4 Ton	10%	6,000	600	1	600	300
Ac Master Service 1-1.5 Ton	10%		600	1.5	400	200
Ac Master Service 2 Ton	10%		600	1.50	400	200
Ac Master Service 4 Ton	5%		300	2.00	150	75
Installation with 10 ft pipe 1-1.5 Ton	5%		300	1.5	200	100
Installation with 10 ft pipe 2 Ton	5%		300	1.5	200	100
Installation with 10 ft pipe 4 Ton	5%		300	2	150	75
Installation with 30 ft pipe 1-1.5 Ton	3%		180	2.00	90	45

Installation with 30 ft pipe 2 Ton	3%		180	2.5	72	36
Installation with 30 ft pipe 4 Ton	3%		180	2.50	72	36
Uninstall 1-1.5 Ton	3%		180	1	180	90
Uninstall 2 Ton	2%		120	1	120	60
Uninstall 4 Ton	2%		120	1.5	80	40
Gas Filling 1-4 Ton	20%		1200	1.00	1,200	600
Ac Water Leak 1-4 Ton	3%		180	1	180	90
Ac Trip Issue 1-4 Ton	3%		180	1.00	180	90
Gas Leakage Repair 1-4 Ton	5%		300	3	100	50
Fan Motor Replace 1-4 Ton	3%		180	2.00	90	45
Total	100%		6,000		4,464	2,232

Table 3: Capacity Calculation – Traditional Air Conditioner Services

Particular	Service Ratio	Total Working Hours Available per Year	Service Hours per Year	Time Required per Service (Hours)	No. of Services in a Year @ 100% Capacity	No. of Services in a Year @ 50% Capacity
Formulas	<i>A</i>	<i>B (Table 1)</i>	<i>C=A*B</i>	<i>D</i>	<i>E=C/D</i>	<i>F=E*50%</i>
Ac General Service 1-4 Ton	10%	4,000	400	1	400	200
Ac Master Service 1-1.5 Ton	10%		400	1.5	267	134
Ac Master Service 2 Ton	10%		400	1.50	267	134

Ac Master Service 4 Ton	5%		200	2	100	50
Installation with 10 ft pipe 1-1.5 Ton	5%		200	1.5	133	67
Installation with 10 ft pipe 2 Ton	5%		200	1.5	133	67
Installation with 10 ft pipe 4 Ton	5%		200	2	100	50
Installation with 30 ft pipe 1-1.5 Ton	3%		120	2	60	30
Installation with 30 ft pipe 2 Ton	3%		120	2.5	48	24
Installation with 30 ft pipe 4 Ton	3%		120	2.5	48	24
Uninstall 1-1.5 Ton	3%		120	1	120	60
Uninstall 2 Ton	2%		80	1	80	40
Uninstall 4 Ton	2%		80	1.5	53	27
Gas Filling 1-4 Ton	20%		800	1	800	400
Ac Water Leak 1-4 Ton	3%		120	1	120	60
Ac Trip Issue 1-4 Ton	3%		120	1	120	60
Gas Leakage Repair 1-4 Ton	5%		200	3	67	34
Fan Motor Replace 1-4 Ton	3%		120	2	60	30
Total	100%		4,000		2,976	1,491

Table 4: Capacity Calculation – Refrigerator Services

Particular	Service Ratio	Total Working Hours Available per Year	Service Hours per Year	Time Required per Service (Hours)	No. of Services in a Year @ 100% Capacity	No. of Services in a Year @ 50% Capacity
Formulas	<i>A</i>	<i>B (Table 1)</i>	$C=A*B$	<i>D</i>	$E=C/D$	$F=E*50\%$
Refrigerant Gas Leakage Repair	15%	6,000	900	2	450.0	225
Refrigerant Gas Re-filling	15%		900	1	900	450
Replacing/ Repairing Thermostat	10%		600	1	600	300
Replacing/ Repairing Compressor	25%		1,500	2	750	375
Relay Change	5%		300	0.75	400	200
Fan Change	10%		600	1.5	400	200
Electrical Cord Repair or Change	5%		300	0.5	600	300
Water Leakage Repair	15%		900	1.5	600	300
Total	100%		6,000		4,700	2,350

6. CRITICAL FACTORS

Following factors should be considered while making investment decision:

- Engagement of highly skilled technicians
- Quality of service as per the client's requirements
- Friendly behavior of staff with the clients
- Courteous dealing with customers and ensuring customer satisfaction
- Reputable and trusted suppliers for supply of tools and equipment
- Dealing with local market competition by providing on-time and quality services

7. GEOGRAPHICAL POTENTIAL FOR INVESTMENT

The proposed Air Conditioner and Refrigerator Installation and Service Center may be established in any city of Pakistan due to nature of the services being provided by the proposed business. Demand for such services will however be higher in urban areas, compared to that in rural areas. Easy availability of skilled technicians and tools and equipment in urban centers is the most important factor for establishing and operating a business like this.

8. POTENTIAL TARGET CUSTOMERS

Potential target customer for the proposed project will be anyone who owns ACs and/or refrigerators. These home appliances are used by a large population of the country on daily basis, by almost the entire middle and upper class.

Pakistan's Household Appliances Market's revenue amounts to \$6.61 billion in 2022. It is expected to grow annually by 0.16% in the next 5 years (CAGR 2022-2027).¹ In relation to total population figures, per person revenues of U\$28.81 are generated in 2022. The market is expected to show a volume growth of 7.9% in 2023 and its volume is expected to amount to 76.7 million pieces by 2027.

Pakistan's air conditioner market size is projected to grow at a CAGR of 7.2% during 2017-23.² Despite economic instability concerns, the Pakistan air conditioner market is growing at a healthy rate owing to increasing disposable income and expanding middle-class population. The income of households in Pakistan has eventually increased owing to a growing working population resulting in high purchasing power, which is further contributing to the growth of the air conditioner market in the country. The split air conditioner segment has dominated the overall air conditioner market due to the high demand arising from the residential sector. Punjab and Sindh provinces

¹ <https://www.statista.com/outlook/cmo/household-appliances/pakistan>

² <http://www.6wresearch.com/industry-report/pakistan-air-conditioner-market-2017-2023-forecast-by-type-applications-regions-competitive-landscape#>

are the key revenue contributing regions that are likely to dominate Pakistan's air conditioner market forecast revenues over the coming years.

Refrigeration has grown to become the most essential food storage technique all around the globe. As key features of any kitchen, refrigerators form an integral part of the home appliances market.

Revenue in the refrigerators segment in Pakistan amounts to \$1.39 billion in 2022. The market is expected to grow annually by -0.25% in the next 5 years (CAGR 2022-2027).³ This segment is expected to show a volume growth of 7.8% in 2023 and is expected to amount to 4.2 million appliances. By 2027. Figure 21 shows revenue trend of refrigerator segment from 2014 to 2027.

Figure 21: Refrigerator Market Revenue



9. PROJECT COST SUMMARY

A detailed financial model has been developed to analyze the commercial viability of an AC and Refrigerator Installation and Service Center. Various costs and revenue related assumptions along with results of the analysis are outlined in this section.

The projected Income Statement, Cost of Goods Sold, Cash Flow Statement and Balance Sheet are attached as Annexure.

9.1. Project Economics

All the figures in this financial model have been calculated after carefully taking into account the relevant assumptions and target market.

³ <https://www.statista.com/outlook/cmo/household-appliances/major-appliances/refrigerators/pakistan>

9.2. Project Cost

Total cost of the project has been calculated to be PKR 3.46 million. The project will be financed through 100% Equity. Table 5 provides the details of the costs calculated for the proposed production unit.

Table 5: Project Cost

Description	Amount (PKR)	Reference
Land	-	9.2.1
Building / Infrastructure	215,790	9.2.2
Tools and Equipment	461,000	9.2.3
Furniture & Fixtures	433,000	9.2.4
Office Equipment	756,000	9.2.5
Office Vehicles	568,000	9.2.6
Pre-operating Costs	204,870	9.2.7
Security against building	240,000	9.2.8
Total Capital Cost	2,878,660	
Working capital		
Upfront building rent	80,000	
Cash	500,000	
Total Working capital	580,000	
Total Project Cost (PKR)	3,458,660	

9.2.1 Land

The proposed AC and Refrigerator Installation and Service Center will be established on a rented land to avoid the high cost. Suitable locations for setting up a facility like this can be easily found on rent. Therefore, no land cost has been added to the project cost. Total space requirement for the proposed unit has been estimated as 1,126 sq. ft. The breakup of the space requirement is provided in Table 6.

Table 6: Breakup of Space Requirement

Break-up of Land Area	Number	% Break-up	Area (Sq. Ft.)
Owners' Office	1	11%	120
Accounts Office	1	8%	90
Repair Area	1	67%	756

Washroom	2	14%	160
Total		100%	1,126

9.2.2 Renovation Cost

There will be no construction cost of building since the unit will be started on a rented building. Furthermore, there will be a renovation cost; required to make the building usable for the business. The proposed project requires electricity load of around 6.26 KW for which an electricity connection under the General Supply Tariff-Industrial three phase will be required. Building rent of PKR 80,000 per month has been included in the operating cost. Building renovation cost is shown in Table 7.

Table 7: Renovation Cost

Cost Item	Unit of Measurement	Total Liter / Area / Number	Cost/Unit/ Sq.feet (PKR)	Total Cost (PKR)
Paint Cost	Liter	34	800	27,440
Labour Cost- Paint	Sq. Feet	3,430	15	51,450
Blinds	Units	4	7,000	28,000
Glass Partition	Sq. Feet	198	550	108,900
Total (PKR)				215,790

9.2.3 Tools and Equipment

Table 8 provides details of tools and equipment required for the project.

Table 8: Tools and Equipment Cost

Cost Item	No.	Unit Cost (PKR)	Total Cost (PKR)
Guage Manifold	6	5,000	30,000
Digital Clamp Multi Meter	6	2,500	15,000
Nose Pliers	6	1,200	7,200
Screw Driver Set	6	1,600	9,600
Socket Wrench Set	6	4,500	27,000
L Key Set	6	1,000	6,000
Mini Gas Welding Machine	3	40,000	120,000
Welding Torch	6	4,000	24,000
Swaging Tool	6	4,000	24,000

Level Tool	6	2,500	15,000
Tubing Cutter	6	2,000	12,000
Manual Tube Bender	6	4,500	27,000
Drill Machine	6	5,000	30,000
Measuring tape	6	1,500	9,000
Pipe Cutter	6	1,200	7,200
Hammer	6	500	3,000
Wire Cutter	6	500	3,000
Pressure Washer 105 bar	4	20,000	80,000
Gas Cylinders Cost	12	1,000	12,000
Total			461,000

9.2.4 Furniture & Fixtures

Table 9 provides details of the furniture and fixture requirement of the project.

Table 9: Furniture & Fixtures

Cost Item	No.	Unit Cost (PKR)	Total Cost (PKR)
Executive Table	1	60,000	60,000
Office Table	2	30,000	60,000
Executive Chairs	1	30,000	30,000
Office Chair	2	14,000	28,000
Staff Plastic Chair(s)	12	2,000	24,000
Staff Table	3	6,000	18,000
Sofa Sets	1	45,000	45,000
Racks	10	15,000	150,000
Benches	3	6,000	18,000
Total			433,000

9.2.5 Office Equipment

Details of office equipment required for the project are provided in Table 10.

Table 10: Office Equipment

Cost Item	No.	Unit Cost (PKR)	Total Cost (PKR)
Air Conditioner (1 Ton Inverter)	2	85,000	170,000
Laptop	1	100,000	100,000
Desktop Computer	1	75,000	75,000
Printer	1	50,000	50,000
LED/LCD 32	1	40,000	40,000
Water Dispenser	1	25,000	25,000
Ceiling Fan	4	8,000	32,000
Exhaust Fan	5	4,500	22,500
Pedestal Fan	2	10,000	20,000
Wi-Fi Router and Connection	1	3,500	3,500
Security System (1 MP)	6	2,500	15,000
DVR	1	15,000	15,000
Total			568,000

9.2.6 Office Vehicles

Details of office vehicles required for the project are provided in Table 11. There will be one motorcycle for each technician team.

Table 11: Office Vehicles

Cost Item	Units	Unit Cost (PKR)	Total Cost (PKR)
Motorcycle	6	120,000	720,000
Registration Fee		6,000	36,000
Total	6		756,000

9.2.7 Pre-Operating Cost

Details of pre-operating cost for the project are provided in Table 12.

Table 12: Pre-Operating Cost

Cost Item	Number of Months	Total Cost (PKR)
Administration expense	1	132,500
Utilities expense	1	22,370
Website Cost		50,000
Total		204,870

9.2.8 Security against Building

Details of security against building for the project are provided in Table 13.

Table 13: Security against Building

Cost Item	Months	Unit Cost / Month (PKR)	Total Cost (PKR)
Security against Building	3	80,000	240,000
Total			240,000

9.3. Financial Feasibility Analysis

The financial feasibility analysis given in Table 14 provides the information regarding projected IRR, NPV and payback period of the study based on 100% equity.

Table 14: Financial Feasibility Analysis

Description	Project
IRR	80%
NPV (PKR)	15,961,194
Payback Period (years)	1.92
Projection Years	10
Discount Rate used for NPV	25%

9.4. Financial Feasibility Debt Financing

Table 15 provides the information regarding projected IRR, NPV and payback period of the study based on combination of equity (50%) and debt (50%) financing for the proposed project.

Table 15: Financial Feasibility Debt Financing

Description	Project
IRR	78%
NPV (PKR)	18,910,519
Payback Period (years)	2.02
Projection Years	10
Discount Rate used for NPV	22%

9.5. Breakeven Analysis

Breakeven analysis is provided in Table 16.

Table 16: Breakeven Analysis

Particulars	Amount First Year (PKR)	Ratio
Sales (PKR) – A	11,954,190	100%
Variable Cost (PKR) – B	7,527,144	63%
Contribution (PKR) (A-B) = C	4,427,046	37%
Fixed Cost (PKR) – D	3,493,615	29%
Break Even Revenue (PKR) (D/CM) =E	9,433,682	
Breakeven No. of Services	4,793	
Breakeven Capacity	39%	

9.6. Revenue Generation

Based on the 50% capacity utilization of the unit, sales revenues during the first year of operations is estimated in Table 17.

Table 17: Revenue Generation - Inverter Air Conditioner Services

Particulars	Number of Services (A)	Service Charges (PKR)(B)	Total Revenue (PKR) (A*B)
Ac General Service 1-4 Ton	300	1,500	450,000
Ac Master Service 1-1.5 Ton	200	2,000	400,000

Ac Master Service 2 Ton	200	2,000	400,000
Ac Master Service 4 Ton	75	3,000	225,000
Installation with 10 ft pipe 1-1.5 Ton	100	2,200	220,000
Installation with 10 ft pipe 2 Ton	100	2,200	220,000
Installation with 10 ft pipe 4 Ton	75	3,000	225,000
Installation with 30 ft pipe 1-1.5 Ton	45	3,000	135,000
Installation with 30 ft pipe 2 Ton	36	3,500	126,000
Installation with 30 ft pipe 4 Ton	36	3,500	126,000
Uninstall 1-1.5 Ton	90	1,500	135,000
Uninstall 2 Ton	60	1,500	90,000
Uninstall 4 Ton	40	2,000	80,000
Gas Filling 1-4 Ton	600	1,000	600,000
Ac Water Leak 1-4 Ton	90	1,500	135,000
Ac Trip Issue 1-4 Ton	90	1,500	135,000
Gas Leakage Repair 1-4 Ton	50	3,000	150,000
Fan Motor Replace 1-4 Ton	45	3,000	135,000
Total	2,232		3,987,000

Table 18: Revenue Generation – Traditional Air Conditioner Services

Particulars	Number of Services (A)	Service Charges (PKR)(B)	Total Revenue (PKR) (A*B)
Ac General Service 1-4 Ton	200	1,500	300,000
Ac Master Service 1-1.5 Ton	134	2,000	268,000
Ac Master Service 2 Ton	134	2,000	268,000
Ac Master Service 4 Ton	50	3,000	150,000
Installation with 10 ft pipe 1-1.5 Ton	67	2,200	147,400
Installation with 10 ft pipe 2 Ton	67	2,200	147,400
Installation with 10 ft pipe 4 Ton	50	3,000	150,000
Installation with 30 ft pipe 1-1.5 Ton	30	3,000	90,000
Installation with 30 ft pipe 2 Ton	24	3,500	84,000
Installation with 30 ft pipe 4 Ton	24	3,500	84,000

Uninstall 1-1.5 Ton	60	1,500	90,000
Uninstall 2 Ton	40	1,500	60,000
Uninstall 4 Ton	27	2,000	54,000
Gas Filling 1-4 Ton	400	1,000	400,000
Ac Water Leak 1-4 Ton	60	1,500	90,000
Ac Trip Issue 1-4 Ton	60	1,500	90,000
Gas Leakage Repair 1-4 Ton	34	3,000	102,000
Fan Motor Replace 1-4 Ton	30	3,000	90,000
Total	1,491		2,664,800

Table 19: Revenue Generation – Refrigerator Services

Particulars	Number of Services (A)	Service Charges (PKR)(B)	Total Revenue (PKR) (A*B)
Refrigerant Gas Leakage Repair	225	2,000	450,000
Refrigerant Gas Re-filling	450	1,000	450,000
Replacing/ Repairing Thermostat	300	1,000	300,000
Replacing/ Repairing Compressor	375	2,000	750,000
Relay Change	200	800	160,000
Fan Change	200	1,500	300,000
Electrical Cord Repair or Change	300	500	150,000
Water Leakage Repair	300	1,500	450,000
Total	2,350		3,010,000

Table 20: Bifurcation of Services

Particulars	No. of Services in Year 1	Service Ratio	Bifurcated Services
Inverter Air Conditioner			
Gas Filling			
1 Ton AC	600	50%	300
1.5 Ton AC		20%	120

2 Ton AC		20%	120
4 Ton AC		10%	60
Gas Leakage Repair			
1 Ton Ac	50	50%	25
1.5 Ton Ac		20%	10
2 Ton Ac		20%	10
4 Ton Ac		10%	5
Simple Air Conditioner			
Gas Filling			
1 Ton Ac	400	50%	200
1.5 Ton Ac		20%	80
2 Ton Ac		20%	80
4 Ton Ac		10%	40
Gas Leakage Repair			
1 Ton Ac	34	50%	17
1.5 Ton Ac		20%	7
2 Ton Ac		20%	7
4 Ton Ac		10%	3

Table 21: Consumption of Refrigerant

Particulars	Quantity of Refrigerant Refilled after Leakage Repair (KG)	Quantity of Refrigerant in Simple Refilling (KG)
1 Ton AC	1	0.4
1.5 Ton AC	1.4	0.56
2 Ton AC	2.5	1
4 Ton AC	4	1.6
Refrigerator	0.4	0.2

Table 22: Revenue Generation – Refrigerant Gas

Particulars	No. of Services in Year 1 (A)	Quantity of Refrigerant Refilled (KG) (B)	Total Quantity of Refrigerant (KG) (A*B)=C	Refrigerant Price Per KG (D)	Total Revenue (PKR) (C*D)
Inverter Air Conditioner - R-410A					
Gas Filling	(Table 20)	(Table 21)			
1 Ton AC	300	0.4	120	1,900	228,000
1.5 Ton AC	120	0.56	67.2	1,900	127,680
2 Ton AC	120	1	120	1,900	228,000
4 Ton AC	60	1.6	96	1,900	182,400
Sub Total	600		403.2		766,080
Gas Leakage Repair					
1 Ton AC	25	1	25	1,900	47,500
1.5 Ton AC	10	1.4	14	1,900	26,600
2 Ton AC	10	2.5	25	1,900	47,500
4 Ton AC	5	4	20	1,900	38,000
Sub-Total	50		84		159,600
Simple Air Conditioner - R-22					
Gas Filling					
1 Ton AC	200	0.4	80	2,100	168,000
1.5 Ton AC	80	0.56	44.8	2,100	94,080

2 Ton AC	80	1	80	2,100	168,000
4 Ton AC	40	1.6	64	2,100	134,400
Sub-Total	400		268.8		564,480
Gas Leakage Repair					
1 Ton AC	17	1	17	2,100	35,700
1.5 Ton AC	7	1.4	9.8	2,100	20,580
2 Ton AC	7	2.5	17.5	2,100	36,750
4 Ton AC	3	4	12	2,100	25,200
Sub-Total	34		56.3		118,230
Refrigerator - R-134A					
Refrigerant Gas Re-filling	450	0.2	90	3,800	342,000
Refrigerant Gas Leakage Repair	225	0.4	90	3,800	342,000
Sub-Total	675		180		684,000
Total					2,292,390

9.7. Variable Cost Estimate

Variable costs of the project have been provided in detail in Table 23. Refrigerant gas cost calculation is shown in Table 24.

Table 23: Variable Cost Estimate

Variable Cost	Cost (PKR)
Refrigerant Gas Cost (Table 24)	2,075,930
Vehicle Fuel Cost	496,800
Direct Labor	4,560,000
Direct Electricity	52,414
Communications expense (phone, fax, mail, internet, etc.)	171,000
Office expenses (stationery, entertainment, janitorial services, etc.)	171,000
Total Variable Cost (PKR)	7,527,144

Table 24: Refrigerant Gas Cost

Particulars	No. of Services in Year 1 (A)	Quantity of Refrigerant Refilled (KG) (B)	Total Quantity of Refrigerant Sold (KG) (A*B)=C	Refrigerant Cost Per KG (D)	Total Cost (PKR) (C*D)
Inverter Air Conditioner – R-410A					
Gas Filling	(Table 20)	(Table 21)			
1 Ton AC	300	0.4	120	1,700	204,000
1.5 Ton AC	120	0.56	67.2	1,700	114,240
2 Ton AC	120	1	120	1,700	204,000
4 Ton AC	60	1.6	96	1,700	163,200
Sub-Total	600		403.2		685,440
Gas Leakage Repair					
1 Ton AC	25	1	25	1,700	42,500
1.5 Ton AC	10	1.4	14	1,700	23,800
2 Ton AC	10	2.5	25	1,700	42,500
4 Ton AC	5	4	20	1,700	34,000
Sub-Total	50		84		142,800
Simple Air Conditioner - R-22					
Gas Filling					
1 Ton AC	200	0.4	80	1,900	152,000

1.5 Ton AC	80	0.56	44.8	1,900	85,120
2 Ton AC	80	1	80	1,900	152,000
4 Ton AC	40	1.6	64	1,900	121,600
Sub-Total	400		268.8		510,720
Gas Leakage Repair					
1 Ton AC	17	1	17	1,900	32,300
1.5 Ton AC	7	1.4	9.8	1,900	18,620
2 Ton AC	7	2.5	17.5	1,900	33,250
4 Ton AC	3	4	12	1,900	22,800
Sub-Total	34		56.3		106,970
Refrigerator – R-134A					
Refrigerant Gas Re-filling	450	0.2	90	3,500	315,000
Refrigerant Gas Leakage Repair	225	0.4	90	3,500	315,000
Sub-Total	675		180		630,000
Total					2,075,930

9.8. Fixed Cost Estimate

Table 25 provides details of fixed cost for the project.

Table 25: Fixed Cost Estimate

Fixed Cost	Cost (PKR)
Management Staff	1,140,000
Administration benefits expense	474,000
Building rental expense	960,000
Electricity	242,229
Depreciation expense	377,329
Amortization of pre-operating costs	40,974
Website Maintenance Cost	20,000
Total Cost (PKR)	3,493,615

9.9. Human Resource Requirement

For the 1st year of operations, the center shall require the workforce at a salary cost. Table 26 provides details of permanent labor required, which include technicians for Inverter AC and refrigerators, who will be available throughout the year. Table 27 provides details of temporary labor required for traditional air conditioners who will be available for 8 months in a year from March till October, as the remaining 4 months are considered as off-season for them.

Table 26: Human Resource-Permanent Labor

Designation	No of Persons	Average Monthly Salary (PKR)	Total Salary (PKR)
Supervisor	1	60,000	720,000
Inverter Air Conditioner Skilled Technician	2	35,000	840,000
Inverter Air Conditioner Unskilled Labor	2	25,000	600,000
Refrigerator Skilled Technician	2	35,000	840,000
Refrigerator Unskilled Labor	2	25,000	600,000
Accountant	1	45,000	540,000
Office Boy	1	25,000	300,000
Security Guard	1	25,000	300,000
Total	12		4,740,000

Table 27: Human Resource-Temporary Labor⁴

Designation	No of Persons	Average Monthly Salary (PKR)	Total Salary (PKR)
Air Conditioner Skilled Technician	2	35,000	560,000
Air Conditioner Unskilled Labor	2	25,000	400,000
Total	4		960,000

10. CONTACT DETAILS

Details of some AC and Refrigerator Installation and Service Centers are provided in Table 28.

Table 28: Contact Details

Name of Supplier	Nature of Supplier	City	Address	Contact
Husnain AC & Geyser Services	A/C Service and Installation	Lahore	31-16-B1 Kashmir Road Near Akbar Chowk, Township	0300 7359393
XPERT & FIXIT Split AC Service	A/C Repair Service	Lahore	14 G Ext, Block N Model Town	0302 8066725
Islamabad AC Service & Installation	A/C Service and Installation	Islamabad	559 Street 109, I-8/4 I 8/4 I-8	0333 5322024
The Technician	A/C Repair Service	Islamabad	Sardar Farman Ali Avenue, opp. Ghorī VIP	0300 9614810
Home service ac repair & service	A/C Repair Service	Karachi	Jamia Millia Rd, Millat Town Malir 15	0333 2060874
Repair Home Appliances	Refrigerator Repair Service	Lahore	321 Main Boulevard Gulberg, Block D1	0321 4792084
Bosch and Siemens Service Center	Appliance Repair Service	Islamabad	Shop, 17-GF, Ahmad Center Plaza, I-8	0302 5006683

⁴ Non-inverter air conditioners only work in Pakistan during the summer; hence their services are in high demand during this time. To avoid unnecessary salary costs during the winter season, temporary labor is added that will only work during the summer season.

Sardar Air Conditioning and Refrigerator Repair Shop	Repair Service	Karachi	Johar Mor Rd Service Ln, Block 17 Gulistan-e-Johar,	0313 2407196
Ehsan International Supplier	Refrigerant Gases	Karachi	40/9, Aurangabad, Nazimabad	+92 333-3454598
Kaghan Trading Company	Refrigerant Gases	Karachi	Plot No 86 Sector 15 Korangi Industrial	+9221-5067082
Ibrar AC repairing	Repair Service	Peshawar	Khyber Colony 1, Tahkal, Peshawar,	0314-9892412
M.R Air Conditioning & Refrigeration	Repair Service	Quetta	22 Shawaksha Road, Quetta,	0345-8378187
Habib Electronics	Repair Service	Gilgit	82F+458, Chalt Valley Road, Chalt, Gilgit	0312-2632748

11. USEFUL LINKS

Table 29: Useful Links

Name of Organization	E-mail Address
Small and Medium Enterprises Development Authority (SMEDA)	www.smeda.org.pk
National Business Development Program (NBDP)	www.nbdp.org.pk
Government of Pakistan	www.pakistan.gov.pk
Ministry of Federal Education and Professional Training	www.mofept.gov.pk
Government of Punjab	www.punjab.gov.pk
Government of Sindh	sindh.gov.pk/
Government of Balochistan	balochistan.gov.pk/
Government of KPK	kp.gov.pk/
Government of Gilgit Baltistan	gilgitbaltistan.gov.pk/
Government of Azad Jammu & Kashmir	ajk.gov.pk/
Trade Development Authority of Pakistan	www.tdap.gov.pk
Securities and Exchange Commission of Pakistan	www.secp.gov.pk
State Bank of Pakistan	www.sbp.gov.pk
Federal Board of Revenue	www.fbr.gov.pk
Federation of Pakistan Chambers of Commerce and Industry (FPCCI)	www.fpcci.com.pk
Pakistan Stock Exchange (PSX)	www.psx.com.pk

12. ANNEXURES

12.1. Income Statement

Calculations	SMEDA									
Income Statement										
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Revenue- Inverter Air Conditioner Services	3,987,000	4,886,684	5,914,390	7,137,129	8,530,520	10,178,808	12,066,617	14,260,124	16,781,924	19,702,727
Revenue- Traditional Air Conditioner Services	2,664,800	3,248,374	3,945,812	4,749,928	5,694,455	6,779,071	8,036,344	9,503,666	11,182,494	13,137,924
Revenue- Refrigeration Services	3,010,000	3,684,056	4,466,397	5,383,270	6,443,379	7,680,226	9,105,739	10,762,636	12,667,103	14,873,564
Revenue- Refrigerant Gas	2,292,390	2,799,909	3,387,151	4,075,384	4,872,940	5,796,394	6,866,442	8,106,939	9,530,109	11,179,736
Total Revenue	11,954,190	14,619,023	17,713,750	21,345,710	25,541,294	30,434,499	36,075,142	42,633,365	50,161,630	58,893,951
<i>Cost of sales</i>										
Refrigerant Gas Cost	2,075,930	2,520,273	3,029,882	3,622,161	4,302,514	5,083,466	5,980,549	7,011,659	8,184,083	9,531,615
Vehicle Fuel Cost	496,800	602,767	725,294	866,665	1,029,465	1,216,607	1,431,379	1,677,487	1,959,107	2,280,945
Direct Labor	4,560,000	5,002,320	5,487,545	6,019,837	6,603,761	7,244,326	7,947,026	8,717,887	9,563,522	10,491,184
Direct Electricity	52,414	56,555	61,023	65,844	71,045	76,658	82,714	89,248	96,299	103,906
Total Cost of Sales	7,185,144	8,181,916	9,303,743	10,574,507	12,006,785	13,621,057	15,441,667	17,496,281	19,803,011	22,407,650
Gross Profit	4,769,046	6,437,107	8,410,007	10,771,203	13,534,508	16,813,442	20,633,475	25,137,084	30,358,618	36,486,300
<i>General administration & selling expenses</i>										
Management Staff	1,140,000	1,250,580	1,371,886	1,504,959	1,650,940	1,811,081	1,986,756	2,179,472	2,390,881	2,622,796
Administration benefits expense	474,000	519,978	570,416	625,746	686,444	753,029	826,072	906,201	994,103	1,090,531
Building rental expense	960,000	1,056,000	1,161,600	1,277,760	1,405,536	1,546,090	1,700,699	1,870,768	2,057,845	2,263,630
Electricity	242,229	261,365	282,013	304,292	328,331	354,269	382,256	412,454	445,038	480,196
Website Maintenance Cost	20,000	22,060	24,332	26,838	29,603	32,652	36,015	39,725	43,816	48,329
Communications expense (phone, fax, mail, internet, etc.)	171,000	187,587	205,783	225,744	247,641	271,662	298,013	326,921	358,632	393,419
Office expenses (stationery, entertainment, janitorial services, etc.)	171,000	187,587	205,783	225,744	247,641	271,662	298,013	326,921	358,632	393,419
Promotional expense	239,084	292,380	354,275	426,914	510,826	608,690	721,503	852,667	1,003,233	1,177,879
Depreciation expense	377,329	377,329	377,329	498,713	498,713	406,513	478,470	823,439	702,055	912,445
Amortization of pre-operating costs	40,974	40,974	40,974	40,974	40,974	-	-	-	-	-
Subtotal	3,835,615	4,195,840	4,594,391	5,157,685	5,646,648	6,055,648	6,727,798	7,738,568	8,354,234	9,382,645
Operating Income	933,430	2,241,267	3,815,616	5,613,519	7,887,860	10,757,794	13,905,678	17,398,516	22,004,384	27,103,656
Gain / (loss) on sale of office equipment	-	-	-	-	-	-	142,000	-	-	-
Gain / (loss) on sale of office vehicles	-	-	-	-	-	-	189,000	-	-	-
Earnings Before Interest & Taxes	933,430	2,241,267	3,815,616	5,613,519	7,887,860	10,757,794	14,236,678	17,398,516	22,004,384	27,103,656
Subtotal	-	-	-	-	-	-	-	-	-	-
Earnings Before Tax	933,430	2,241,267	3,815,616	5,613,519	7,887,860	10,757,794	14,236,678	17,398,516	22,004,384	27,103,656
Tax	149,427	182,738	433,123	808,042	1,761,965	2,034,449	2,960,086	3,829,592	5,096,206	6,498,505
NET PROFIT/(LOSS) AFTER TAX	784,003	2,058,529	3,382,493	4,805,477	6,125,895	8,723,346	11,276,591	13,568,924	16,908,179	20,605,150

12.2. Balance Sheet

Calculations	SMEDA										
Balance Sheet											
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Assets											
<i>Current assets</i>											
Cash & Bank	500,000	1,302,304	2,545,071	3,425,386	5,205,225	7,018,807	8,554,934	16,824,695	31,201,468	47,742,601	69,448,832
Pre-paid building rent	80,000	88,000	96,800	106,480	117,128	128,841	141,725	155,897	171,487	188,636	-
Total Current Assets	580,000	1,390,304	2,641,871	3,531,866	5,322,353	7,147,648	8,696,659	16,980,592	31,372,955	47,931,236	69,448,832
<i>Fixed assets</i>											
Building/Infrastructure	215,790	194,211	172,632	151,053	129,474	107,895	86,316	64,737	43,158	21,579	-
Tools and Equipment	461,000	368,800	276,600	791,322	577,737	364,153	1,041,801	760,610	479,419	1,371,565	1,001,368
Furniture & fixtures	433,000	368,050	303,100	238,150	173,200	108,250	43,300	822,549	699,167	575,784	452,402
Office vehicles	756,000	642,600	529,200	415,800	302,400	189,000	75,600	1,569,577	1,334,141	1,098,704	863,267
Office equipment	568,000	482,800	397,600	312,400	227,200	142,000	56,800	1,079,002	917,152	755,301	593,451
Advance Against Building Rent	240,000	240,000	240,000	240,000	240,000	240,000	240,000	240,000	240,000	240,000	240,000
Total Fixed Assets	2,673,790	2,296,461	1,919,132	2,148,725	1,650,011	1,151,298	1,543,817	4,536,475	3,713,036	4,062,933	3,150,488
<i>Intangible assets</i>											
Pre-operation costs	204,870	163,896	122,922	81,948	40,974	-	-	-	-	-	-
Legal, licensing, & training costs	-	-	-	-	-	-	-	-	-	-	-
Total Intangible Assets	204,870	163,896	122,922	81,948	40,974	-	-	-	-	-	-
TOTAL ASSETS	3,458,660	3,850,661	4,683,925	5,762,539	7,013,338	8,298,946	10,240,476	21,517,067	35,085,991	51,994,170	72,599,320
Liabilities & Shareholders' Equity											
Total Current Liabilities	-	-	-	-	-	-	-	-	-	-	-
<i>Other liabilities</i>											
<i>Shareholders' equity</i>											
Paid-up capital	3,458,660	3,458,660	3,458,660	3,458,660	3,458,660	3,458,660	3,458,660	3,458,660	3,458,660	3,458,660	3,458,660
Retained earnings	-	392,001	1,225,265	2,303,879	3,554,678	4,840,287	6,781,816	18,058,407	31,627,332	48,535,510	69,140,661
Total Equity	3,458,660	3,850,661	4,683,925	5,762,539	7,013,338	8,298,946	10,240,476	21,517,067	35,085,991	51,994,170	72,599,320
TOTAL CAPITAL AND LIABILITIES	3,458,660	3,850,661	4,683,925	5,762,539	7,013,338	8,298,946	10,240,476	21,517,067	35,085,991	51,994,170	72,599,320

12.3. Cash Flow Statement

Calculations											SMEDA
Cash Flow Statement											
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
<i>Operating activities</i>											
Net profit		784,003	2,058,529	3,382,493	4,805,477	6,125,895	8,723,346	11,276,591	13,568,924	16,908,179	20,605,150
Add: depreciation expense		377,329	377,329	377,329	498,713	498,713	406,513	478,470	823,439	702,055	912,445
amortization of pre-operating costs		40,974	40,974	40,974	40,974	40,974	-	-	-	-	-
Pre-paid building rent	(80,000)	(8,000)	(8,800)	(9,680)	(10,648)	(11,713)	(12,884)	(14,172)	(15,590)	(17,149)	188,636
Cash provided by operations	(80,000)	1,194,306	2,468,032	3,791,116	5,334,516	6,653,869	9,116,975	11,740,888	14,376,774	17,593,084	21,706,231
<i>Financing activities</i>											
Issuance of shares	3,458,660	-	-	-	-	-	-	-	-	-	-
Cash provided by / (used for) financing activit	3,458,660	-	-	-	-	-	-	-	-	-	-
<i>Investing activities</i>											
Capital expenditure	(2,878,660)	-	-	(606,922)	-	-	(799,032)	(3,471,128)	-	(1,051,952)	-
Cash (used for) / provided by investing activit	(2,878,660)	-	-	(606,922)	-	-	(799,032)	(3,471,128)	-	(1,051,952)	-
NET CASH	500,000	1,194,306	2,468,032	3,184,194	5,334,516	6,653,869	8,317,943	8,269,760	14,376,774	16,541,133	21,706,231

13. KEY ASSUMPTIONS

13.1. Operating Cost Assumptions

Table 30: Operating Cost Assumptions

Description	Details
Building rent growth rate	10%
Furniture and fixture depreciation	15%
Vehicle depreciation	15%
Office equipment depreciation	15%
Inflation rate	10.3%
Wage growth rate	9.7%
Electricity price growth rate	7.9%
Office equipment price growth rate	9.6%
Office vehicle price growth rate	11%

13.2. Revenue Assumptions

Table 31: Revenue Assumptions

Description	Details
Sale price growth rate	11.2%
Initial capacity utilization	50%
Capacity growth rate	5%
Maximum capacity utilization	95%

13.3. Financial Assumptions

Table 32: Financial Assumptions

Description	Details
Project life (Years)	10
Debt: Equity	0:100
Discount Rate used for NPV	25%

13.4. Debt related Assumptions

Table 33: Debt Related Assumptions

Description	Details
Project life (Years)	10
Debt: Equity	50:50

Discount Rate used for NPV	22%
Debt Tenure	5 years
Grace Period	1 Year
Interest Rate (KIBOR+3%)	19%

Small and Medium Enterprises Development Authority

HEAD OFFICE

4th Floor, Building No. 3, Aiwan-e-Iqbal Complex, Egerton Road, Lahore
Tel: (92 42) 111 111 456, Fax: (92 42) 36304926-7

www.smeda.org.pk, helpdesk@smeda.org.pk

REGIONAL OFFICE PUNJAB	REGIONAL OFFICE SINDH	REGIONAL OFFICE KPK	REGIONAL OFFICE BALOCHISTAN
3 rd Floor, Building No. 3, Aiwan-e-Iqbal Complex, Egerton Road Lahore, Tel: (042) 111-111-456 Fax: (042) 36304926-7 helpdesk.punjab@smeda.org.pk	5 TH Floor, Bahria Complex II, M.T. Khan Road, Karachi. Tel: (021) 111-111-456 Fax: (021) 5610572 helpdesk-khi@smeda.org.pk	Ground Floor State Life Building The Mall, Peshawar. Tel: (091) 9213046-47 Fax: (091) 286908 helpdesk-pew@smeda.org.pk	Bungalow No. 15-A Chaman Housing Scheme Airport Road, Quetta. Tel: (081) 831623, 831702 Fax: (081) 831922 helpdesk-qta@smeda.org.pk