Pre-feasibility Study

MANUFACTURING UNIT FOR ELECTRONIC CAPACITORS, RESISTORS AND CONNECTORS

November 2021

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, andrevenues 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

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2. EXECUTIVE SUMMARY

An electronic circuit is a structure that directs and controls electric current to perform various functions including signal amplification, computation, and data transfer etc. in large variety of electronic devices. It comprises of several different components such as resistors, transistors, capacitors, connectors, inductors, and diodes.They are the elements of a circuit which help in its functioning. They can be classified into two types i.e. Active Components and Passive Components. Active components are those which can give energy to the circuit and amplify the energy of the circuit; whereas passive components do not possess gain and they cannot give energy continuously to the circuit. They cannot amplify the energy of the signal associated with them; they can only reduce it. For example, transistors and amplifiers are active components. While resistor, inductor, capacitor are passive components as they cannot supply extra energy to the circuit. To complete the circuit, conductive wires or traces are used which connect the components to each other and form a circuit. In the proposed unit, capacitors, resistors and connectors are being manufactured.

A capacitor is a basic electronic component that is used for storing, surge suppression and filtering of current in circuit. They are widely used to build different types of electronic circuits in different shapes and sizes. It is a two-terminal[1] electrical component used to store electrical energy in the form of electric field and give this energy again to the circuit when required. The amount of electric charge stored in a capacitor is known as its Capacitance. The greater the capacitance, the more energy it can store. The unit of electrical capacitance is Farad (F) or Micro Farad (µF).

A resistor is a two-terminal electrical device having the main purpose of resisting the flow of current in a circuit so that the excess current does not pass through. If the resistors are not part of a circuit, the current may flow at dangerously high levels resulting in overheating of other components and possibly damaging them. Furthermore, the electrical resistance of a resistor is measured in Ohm (Ω) or Micro Ohm (µΩ). The greater the resistance, the less current can flow, and the lower the resistance, the more current can flow through.

Electrical connectors also known as interconnects, are components that join electrical circuits, devices or components. Most connectors are removable or temporary, but some can be permanent as well. Connectors make electronic products easier to assemble and manufacture. Along with that, they also ease circuit repairs and allow flexibility in design and modification. Usually, connectors are used where it may be desirable to disconnect the subsections at some future time, e.g. power inputs, exterior connections, or printed circuit boards which may need to be replaced.

Currently in Pakistan, these electronic components are imported to fulfill the local demand. Few large scale manufacturers of capacitors are operating in Karachi, Lahore and Gujrat. Resistors and connectors are imported and are not manufactured in Pakistan. Easy availability of raw materials, access to market, availability of low-cost

[1] A **terminal** is the point at which a conductor from a component, device or network comes to an end.

labor, and presence of good industrial infrastructure in these cities make these locations suitable to establish this business. Ability to generate orders through strong networking, direct marketing, and negotiating long-term contracts with industrial units, such as laptop and computer assemblies units, televisions, fridges air conditioners, etc. will be the key success factor of the proposed business.

The maximum production capacity of the unit is 1,120,000 capacitors, 1,120,000 resistors and 1,120,000 connectors operating in a single shift of 8 hours for 280 days per year. Capacity utilization in "Year One" is assumed to be 60%, which translates into production of 672,000 capacitors, 672,000 resistors and 672,000 connectors.

The proposed "Manufacturing Unit for Electronic Capacitors, Resistors and Connectors" will be set up in a rented building with an area of 6,800 square feet. The project requires a total investment of PKR 34.58 million. This includes capital investment of PKR 30.53 million and working capital of PKR 4.05 million. This project is financed through 100% equity. The Net Present Value (NPV) of the project is PKR 58.59 million with an Internal Rate of Return (IRR) of 45% and a Payback period of 2.94 years. Further, this project is expected to generate Gross Annual Revenues of PKR 79.08 million during 1st year, with Gross Profit (GP) ratio ranging from 41% to 51% and Net Profit (NP) ratio ranging from 6% to 22% during the projection period of ten years. The proposed project will achieve its estimated breakeven point at the capacity of 46% (1,556,964 units) with breakeven revenues of PKR 61.08 million.

The proposed project may also be established using leveraged financing. With 50% debt financing, at a cost of KIBOR+3%, the proposed manufacturing unit provides Net Present Value (NPV) of PKR 82.80 million, Internal Rate of Return (IRR) of 46%, and Payback period of 2.91 years. Further, this project is expected to generate Net Profit (NP) ratio ranging from 5% to 22% during the projection period of ten years. The proposed project will achieve its estimated breakeven point at capacity of 50% (1,695,676 units) with breakeven revenues of PKR 66.52 million.

The proposed project will provide employment opportunities to 44 people including the owner. High return on investment and steady growth of the business is expected with the entrepreneur having some prior experience or education in the related field of business. 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 establishing a “Manufacturing Unit for Electronic Capacitors, Resistors and Connectors”. 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 & PRODUCTS

The proposed project involves setting up a Manufacturing Unit for Electronic Capacitors, Resistors and Connectors. Capacitors and resistors are also known as passive components. Passive components are those electrical components that do not generate power, but instead dissipate, store, and/or release power. Furthermore, electronic components vary with resepct to their types, their intended uses, and their requirements in a particular electrical device. Electronic components are intended to be connected together, usually by soldering to a printed circuit board or to create an electronic circuit for a particular function.

Capacitor

A capacitor is a device used to store electrical charge and electrical energy.They are used in virtually every electronics circuit and come in all shapes and sizes, but usually have the same primary components. There are several different types of capacitors such as ceramic capacitors, film capacitors, power film capacitors, electrolytic capacitors and paper capacitors etc. They mainly come in two types of shapes i.e. box and cylindrical. In the proposed manufacturing unit, film capacitors are being manufactured. Film capacitors are widely used because of their superior characteristics. They can be made with very high precision capacitance values, and they can retain that value longer than other capacitor types. This means that the aging process is generally slower in film capacitors than that in other capacitor types. Furthermore, they have a longer shelf and service life, and are very reliable, with a very low average failure rate. Film capacitors have capacitances ranging from below 1nF (nano farad) to 30µF (micro farad).

A film capacitor consists of a thin dielectric[2] or insulator film metallized on one or both sides. Films are composed of conducting material such as thin films of metal. A dielectric, on the other hand, is a non-conducting material such as plastic, ceramic, air, paper, or mica. In the proposed project, a Metallic Polypropylene (MPP) film is used. It is a plastic (polypropylene) film coated with a thin layer of metal, usually aluminum. Aluminum is the conductor and polypropylene is the dielectric.

When the voltage is applied over the the capacitor or is connected to a source, an electric field develops across the dielectric, charging the whole capacitor. The capacitor is able to hold its charge even after disconnection from the source. When the capacitor is connected to a load, the stored energy then flows from the capacitor to the load.

In the proposed project, three types of film capacitors having capacitance of 2µF, 2.5µF and 3.5uf are produced. These types of capacitors are commonly used in laptops, computers, home aapliances and other smart electronic gadgets.

[2] A **dielectric** is an insulating material or a very poor conductor of electric current. When dielectrics are placed in an electric field, practically no current flows in them because, unlike metals, they have no loosely bound, or free, electrons that may drift through the material.

Resistor

A resistor consists of an insulating material such as ceramic and a conducting material such as nickel, aluminum, carbon with copper wire attached at both ends. The greater the thickness of insulating material, and thinner the copper wire, the higher the resistance.

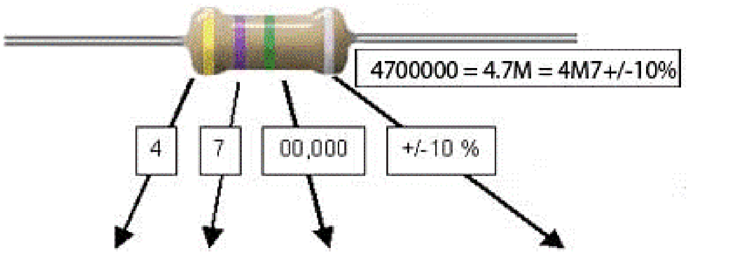
The resistors perform a vital function of controlling the voltage and the flow of current in a circuit. When the electric current starts flowing through a wire, all the electrons start moving in the same direction. When the current passes through a thin wire in a resistor, it becomes progressively harder for the electrons to pass through it. Hence, the number of electrons flowing through a resistor goes down as the length and thinness of the wire increases.

Broadly there are two types of resistors, fixed and variable. Fixed resistors have a fixed resistance regardless of a change in voltage. Their resistance cannot be changed physically or automatically. A fixed resistor supplies a constant, factory-determined resistance and are used when there is a need to restrict current to within a certain range. For example, circuits with LEDs use fixed resistors to limit the current, thus protecting the LED from damage. Although fixed resistors are designed to have a specific resistance, the actual resistance of a resistor may vary (up or down) from its stated resistance by some percentage, known as the resistor's tolerance. Tolerance is usually shown as e.g ±5%. A resistor having ±5% tolerance means that its resistance can either vary up or down by 5% from its stated value.

Furthermore, most of the fixed resistors are color-coded; with their resistance and tolerance values, but some resistors have their values stamped upon them. There are three different types of resistors with respect to their color codes i.e. four band resistor color code, five band resistor color code and six band resistor color code. In the proposed project, four band resistor color codes are being manufactured as they are the most common among them. Resistors are used and needed in several different devices and ways. Some of these require a more accurate resistancel value and closer tolerance ratings than the one which can be achieved in the four band color code.

In the four band resistor color code illustrated in Figure 1, the first three bands (closest together in the resistor’s picture) indicate the value of resistance in ohms. The first two of these bands indicate first two digits of the resistance and the third one, called the multiplier band indicates the number of zeros to be put in the resistance value after the second digit. For example, red, red, red indicates 2200Ω, which can also be called as 2.2KΩ or 2K2. This last version is used in many circuit diagrams and suppliers catalogues (where print may need to be very small) to avoid 2.2K being read as 22K as the decimal point may not be visible clearly, so instead 2K2 is used. The multiplier band is most commonly some color between black (no zeros), indicating a value between10 Ω and a value less than 100Ω, and blue (6 zeros), indicating a value in the tens of millions, e.g. 10,000,000Ω (= brown, black, blue). Two special cases of the multiplier band (band 3) are used for very small values where gold indicates that the first two bands must be divided by 10, and silver means divide by 100. For example, 4.7Ω would be indicated by yellow, violet (47), gold (divided by 10) = 4.7Ω. The fourth band, separated by a space from the three value bands, indicates the tolerance of the resistor.

Figure 1: Four Band Resistor Color Code



Band	1	2	3	4
Meaning	1st Digit	2nd Digit	(No. of zeros)	Tolerance % (No band +/- 20%)
Silver			.00 (divide by 100)	+/-10%
Gold			.0 (divide by 10)	+/-5%
Black	0	0	No Zeros	
Brown	1	1	0	+/-1%
Red	2	2	00	+/-2%
Orange	3	3	,000	
Yellow	4	4	0,000	
Green	5	5	00,000	+/-0.5%
Blue	6	6	,000,000	+/-0.25%
Violet	7	7	0,000,000	+/-0.1%
Grey	8	8		+/-0.05%
White	9	9		

Whereas, a variable resistor, also known as a potentiometer, allows to adjust the resistance from zero ohms to a factory-determined maximum value. Its is used when there is a need to vary the amount of current or voltage being supplied to a part of the circuit. For example, variable resistors are used in light-dimmer switches, volume controls for audio systems and position sensors.

In the proposed project, fixed resistors are manufactured as they are more common as compared to the variable resistors. Furthermore, fixed resistors have various different types such as wirewound resistors, film type resistors, carbon composition resistors, metal oxide metal strip resistors, etc. The wire wound resistors are being manufactured in the proposed manufacturing unit as they have several benefits such as high blocking accuracy, low noise during operation, stability and reliability and can withstand high temperatures.

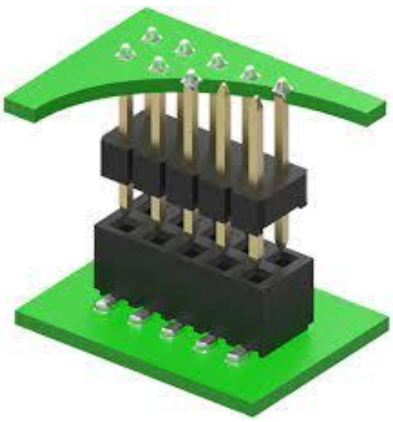
Connector

Most electrical connectors are composed of two main parts i.e. housing and terminal pins or contacts. The terminal pins in a connector provide the electrical conduction that makes the connection. They are made up of some type of metal, but any material that conducts electricity can be used (e.g. copper, nickel, aluminum). Housing is the case or structure used to hold the terminals, stabilize the connection, and protect the contacts from shorting. It can be made up of some type of molded plastic, but can be made out of any type of insulator material (e.g. plastic) as well.

The electrical connectors can be broadly classified into three types based on their termination ends i.e. board-to-board connectors, cable/wire-to-cable/wire connectors, and cable/wire-to-board connectors. Each of them can be further classified into two parts male connectors and female connectors. Male connectors are also referred to as pin headers as they consist of rows of pins which are inserted into the other type i.e. female connectors which can also be called sockets or receptacles. The metal parts of a connector which touches the metal part of the other connector to form an electrical connection are known as contacts. The gender of a connector refers to whether it plugs in or is plugged into and is typically male or female, respectively.

The board-to-board connectors are used to connect printed circuit boards (PCBs) without use of a cable. The board-to-board connectors can save space on cables, making them suitable for systems with limited space such as in laptops, tablets mobile phones, etc. The PCBs can be connected using connectors in parallel or perpendicular configuration depending upon the device they are being used in. Figure 2 shows a male and a female board to board connector.

Figure 2: Board to Board Connectors



Wire-to-wire connectors help in connecting the wires. One end of the connector is permanently connected to the wire. The other end of the connector forms a separable interface which is to be connected with the other connector. Figure 3 shows a male and a female wire to wire connector.

Figure 3: Wire to Wire Connectors

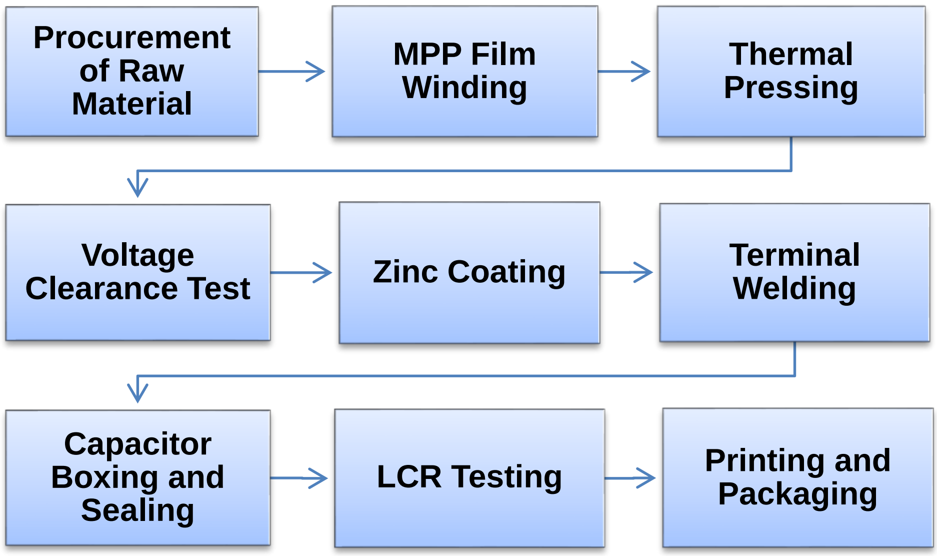
A wire-to-board connector connects a wire/cable to a PCB. The wire connections are similar to the one used for wire-to-wire connection, and the board connections are, for the most part, press-in or soldered connectors whose mating interface for the separable connection is identical to that of a wire-to-wire connector. Figure 4 shows a male and a female wire to board connector.

Figure 4: Wire to Board Connectors

5.1. Production Process

The production process flow of the capacitors is shown in Figure 5.

Figure 5: Process Flow of Capacitors



<u>Procrement of Raw Material</u>

The raw material required in manufacturing of capacitors are Metalllic Polypropylene (MPP) Film, capacitor box, epoxy resin, hardener glue, terminal wire, zinc masking tape, solder wire. Metallised films are the films coated with a thin layer of metal, usually aluminium. Polypropylene is a dielectric material having a low dissipation factor,[3] high dielectric strength,[4] high resistance, and is readily available in the local material. Figure 6 shows MPP film.

Figure 6: MPP Film

[3] Dissipation factor is the. ratio between the insulating materials capacitive reactance to its resistance at a specified frequency.

[44] The dielectric strength of a material is the voltage that a material of a given thickness will resist

Winding

A film winding machine, shown in Figure 7, is used in this process. The MPP films having several turns are mounted on the the rollers at the top. Information is fed into the machine according to the turns required for the particular capacitor. For a 1 µF capacitor 150 MPP film with 150 turns is required; for 2.5 µF capacitor 250 turns; whereas for 3.5 µF capcacitor, 350 turns of MPP film are required. The MPP film is rolled downwards automatically by the machine and cut when the required number of turns are achieved. For example after winding of the MPP film, when 150 turns are achieved for a 1 µF capacitor, the film is cut by the machine;which then automatically drops in the tray shown in Figure 7. It is taken for further processing to the press machine.

Figure 7: Film Winding Machine

Thermal Pressing

The rolled MPP films, according to the specifications of the capacitor, are then fitted on an automatic thermal pressing machine in order to press them in such a way that no gaps remain in between each turn. This process is required to assure smooth flow of current through the capacitor. Figure 8 shows a thermal pressing machine used for capacitor manufacturing.

Figure 8: Thermal Pressing Machine

Voltage Clearance Test

This test is performed on the MPP film after pressing to ensure that at the required voltage, the current flows smoothly through it. This test is performed in automatic Voltage Checking machine, shown in Figure 9.

Figure 9: Voltage Checking Machine

Zinc Coating

Zinc metal is sprayed on the sides of the rolled MPP film, using the zinc spraying machine. This is done to prevent any damage to the MPP film from inside the turns. Figure 10 shows a zinc spraying machine and Figure 11 depicts the difference between MPP film with and without zinc coating.

Figure 10: Zinc Spraying Machine

Figure 11: MPP Film With and Without Zinc Coating

Without Zinc Coating With Zinc Coating

Terminal Welding

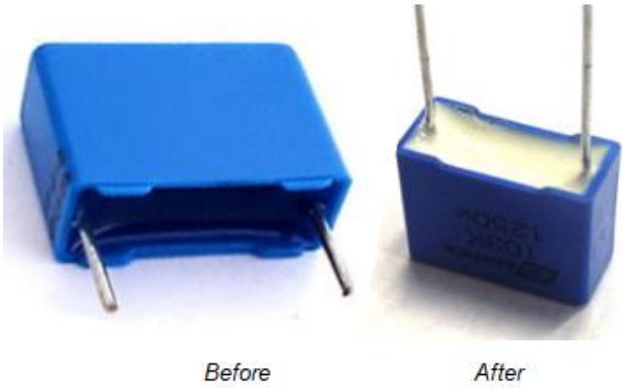
For attaching the terminals with the MPP film, spot welding is used. This welding process is used primarily for welding two or more metals together by applying pressure and providing heat from an electric current to the weld area. Figure 12 shows a spot welding machine. Solder wires will be used for the purpose of spot welding in this process.

Figure 12: Spot Welding Machine

Capacitor Boxing and Sealing

After the terminals are soldered with the MPP film, the capacitor is complete. It is thenput in a capacitor box which is open from one side.I It is sealed from that side with a mixture of epoxy resin and hardener glue. Figure 13 shows a capacitor box before and after sealing.

Figure 13: Capacitor Box Before and After Being Sealed



LCR Testing

Before packaging, an LCR test needs to be done to ensure proper working and quality of the capacitor. It is performed using a Digital LCR Meter shown in Figure 14. An LCR meter is device used to measure the inductance (L), capacitance (C), and resistance (R) of a component or another device. Digital LCR meters measure the current flowing, the voltage, and the phase angle between the measured voltage and current.

Figure 14: LCR Meter

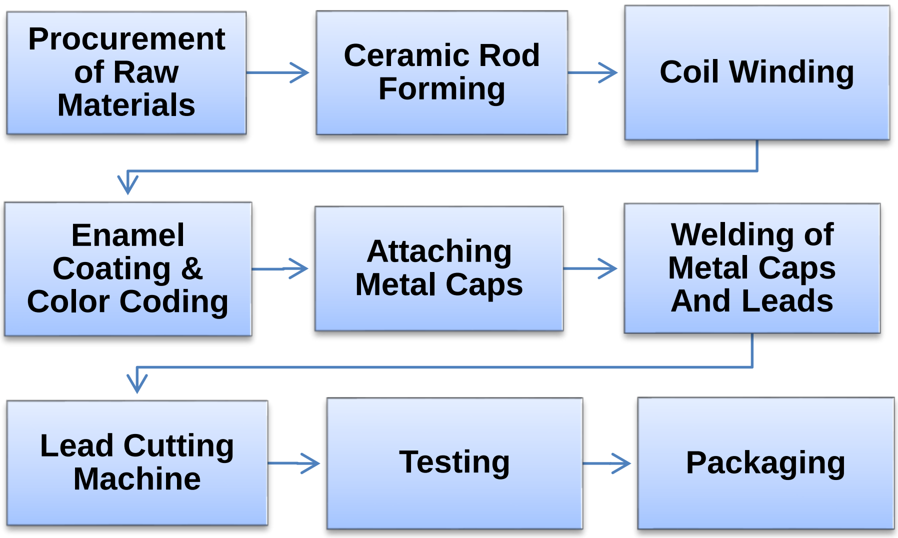
Printing and Packaging

At the end, the specifications and brand name are printed on the capacitor box and are then packed in transparent polyethylene packets. Each packet will contain 5 capacitors each. These packets will then be packaged into corrugated boxes, containing 20 packets each.

Resistors

The production process flow of the resistors is shown in Figure 15.

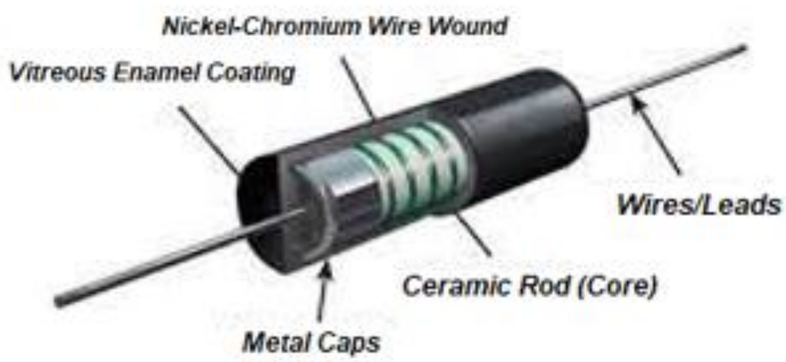
Figure 15: Process Flow for Resistors



Procurement of Raw Material

The raw material required in manufacturing of resistors are ceramic rod, nickel-chromium wire, vitreous enamel, metal caps and leads/wires. They can be easily procured from the local market in bulk quantities. Figure 16 shows a labelled diagram of a resistor.

Figure 16: Labelled Diagram of Resistor



Ceramic Rod Forming

In this process, ceramic powder is molded with the help of a molding hydraulic press machine to form small rod (cylindrical) shapes of ceramic of similar sizes each for all the resistors. Each resistor contains one ceramic rod. Figure 17 shows a ceramic powder molding hydraulic press machine.

Figure 17: Ceramic Powder Molding Hydraulic Press Machine

Coil Winding

The resistance wire made of Nickel Chromium alloy is wound around the ceramic rod by the coil winding machine shown in Figure 18. The number of turns on the rod determine the resistance of the resistor. Lesser the number of turns, greater the resistance and vice versa.

Figure 18: Coil Winding Machine

Coating and Color Coding

As solid cylindrical shaped ceramic rod is porous, it needs protection from corrosion; hence it needs to be coated with vitreous enamel solution. Furthermore, after the vitreous enamel coating, color coding is to be done on the resistor which illustrates the resistance and tolerance of the resistor. The marking machine shown in Figure 19 will be used to perform both these processes.

Figure 19: Marking Machine

Attaching Metal Caps

The metal caps are then attached at both ends of the resistor which assist in attaching the leads with the resistor so that it can be connected in a circuit. For this purpose, epoxy resin and hardener glue are used. This process is done manually by the labor.

Welding of Metal Caps And Leads

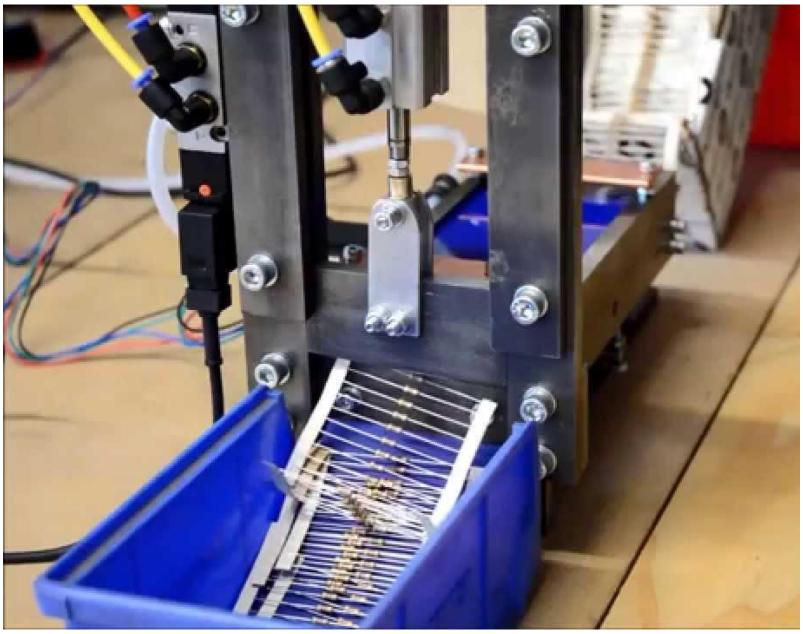
For welding of metal caps to leads/wires, similar process of spot welding is used as done in the manufacturing of capacitor. In this case, leads with specific length are welded with metal caps. Solder wires are used for the purpose of spot welding in this process. Figure 20 shows a spot welding machine.

Figure 20: Spot Welding Machine

Lead Cutting Machine

The resistors with specific length of leads pass through the lead cutting machine, which cuts the leads according to the required length After that, the resistors fall down in the box, to be collected from there.

Figure 21: Lead Cutting Machine



LCR Testing

Before packaging, an LCR test needs to be done to ensure proper working and quality of the resistor. It is performed using a Digital LCR Meter shown in Figure 22. It should be ensured that resistor is not wired into a circuit when measuring its resistance; otherwise, the reading will not be accurate.

Figure 22: LCR Meter

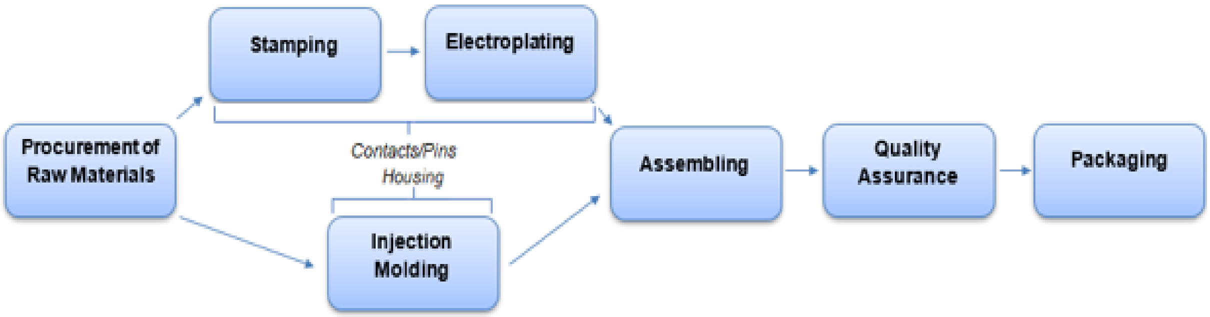
Printing and Packaging

At the end, resistors are packed in transparent polyethylene packets. Each packet contains 5 resistors. These packets are then packaged into corrugated boxes, containing 20 packets each.

The production process flow of the connectors is shown in Figure 23.

Connectors

Figure 23: Process Flow for Connectors



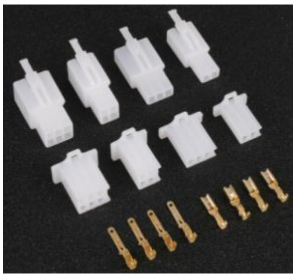
Procurement of Raw Materials

The raw materials required in manufacturing of connnectors include plastic for making connector's housings and large roll metal tape for making contacts or pins. Different plastic materials can be used for making connector housings but the material used in the proposed project is Polybutylene Terephthalate (PBT). It has excellent dielectric and electrical insulation properties, making it an ideal electrical plastic for connectors.The metal used for contacts of connectors is copper due to its good conductivity and malleability. Figure 24 shows a roll of metal tape which is and PBT granules Figure 25 shows the housings and contacts/pins of different connectors.

Figure 24: Raw Materials

Roll of Metal Tape *PBT Granules*

Figure 25: Housing and Contacts



Stamping

In this process, pins or contacts used in connectors are made from thin metal strips through a large high-speed stamping machine shown in Figure 26. One end of the large roll of metal tape is fed from one side of the stamping machine, and the other end is coiled around the hydraulic table (on the left side of the stamping machine), which pulls out the metal tape. The metal tape then passes through the stamping machine and the finished products (pins) are stamped out from the other side.

Figure 26: Stamping Machine

Electroplating

After stamping, the connector pins go through the electroplating process in which they are coated with metal coatings. This is necessary to provide protection to the pins from any kind of corrosion, prevent oxidation and enhance electrical conductivity. Electroplating is the process of coating a metal or metal object with a very thin layer of another metal, usually by applying a direct electric current. This partially dissolves the metals and creates a chemical bond between them. The coating applied by electroplating is usually around 0.0002 inches thick.

In the proposed manufacturing unit, the pins are coated with nickel as it is a hard, durable material having high electrical conductivity. Figure 27 shows an electroplating machine.

Figure 27: Electroplating Machine

Injection Molding

Injection molding is a process to manufacture molded products by injecting plastic materials, melted by heat, into a mold, and then cooling and solidifying them. The method is suitable for mass production of products with complicated shapes. In this manufacturing unit, it is used for manufacturing housing of the electrical connectors.

The PBT granules are loaded into the hopper of injection molding machine. The working principle of the injection molding machine is similar to the syringe used for injection. It uses the thrust of the screw (or plunger) to inject the molten plastic into the closed cavity. Injection molding is a cycled process; each cycle mainly includes:

- **Quantitative feeding**
  Granules are injected from the mixer machine into the barrel through the hopper of the Injection Molding machine to melt them.
- **Melt Plasticizing**
  The granules are melted, by electric heaters, in the barrel to be injected into the molds.
- **Pressure injection**
  The molten plastic is then injected into the molds. As the melt enters the die, the displaced air escapes through vents in the injection pins and along the parting line. It must be ensured that the dies are properly filled to give a proper and smooth shape to the product.
- **Mold Cooling**
  The filled dies are cooled through cycled water to harden the product. Cooling time is dependent on the type of material and the thickness of the part.
- **Mold Opening**
  After cooling the product, the mold is opened and the molded products are ejected into a container with the help of baskets. Dies are then closed and the machine is ready for the next cycle.

An Injection Molding machine and an Injection molding diagram is shown in Figure 28 Figure 29 respectively.

Figure 28: Injection Molding Machine

Figure 29: Injection Molding Diagram

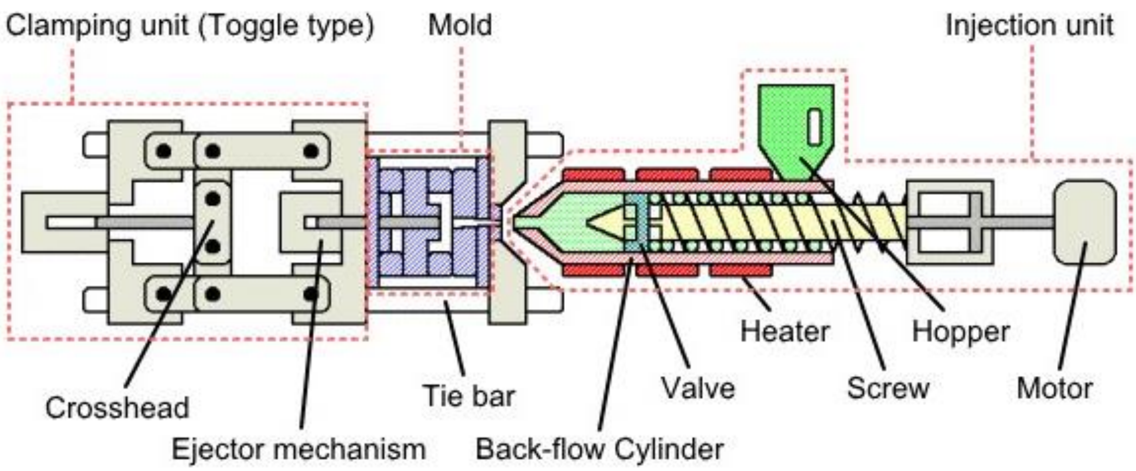
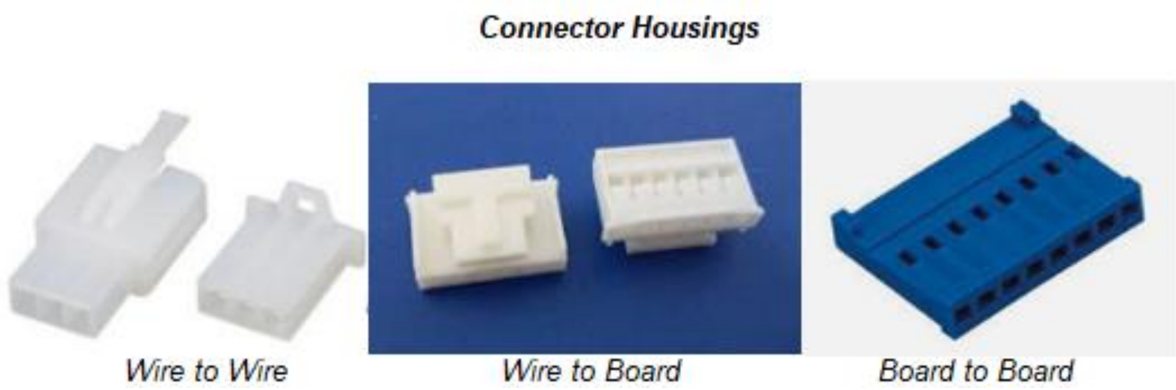


Figure 30:Connector Housings



Assembling

In this process, with the help of an assembling machine, the electroplated pins are inserted into the injected housing to complete the connector. The machine also inspects the omission and the correctness of positioning of all pins during the assembly stage and the spacing measurement of the matching surface. Figure 31 shows an assembling machine having a capacity of assembling 25 pieces per minute and a test time of 1-2 seconds.

Figure 31: Assembling Machine

Printing and Packaging

At the end, the specifications and brand name are printed on the connector box. Connectors are packed in transparent polyethylene packets. Each packet contains 5 capacitors. These packets are then packed in corrugated boxes, containing 20 packets each.

5.2. Installed and Operational Capacities

The proposed manufacturing unit shall, at maximum capacity of 100%, produce 1,120,000 capacitors, 1,120,000 resistors and 1,120,000 connectors. The unit would operate for 8 hours per day, working in one shift per day for 280 working days in a year. The project is assumed to attain a capacity utilization of 60% during first year of operations, to produce 672,000 capacitors, 672,000 resistors and 672,000 connectors. During the projected period of 10 years, the facility will continue to operate with 5% annual increase in capacity utilization each year with a cap at 100%. Table 1 and Table 2 shows installed and operational capacities of the proposed manufacturing unit.

Table 1: Injection Molding Machine Capacity

Products	Production / Day (Units)	Production / Annum (Units)
Capacitor	4,000	1,120,000
Resistor	4,000	1,120,000
Connector	4,000	1,120,000
Total		**3,360,000**

Table 2: Installed and Operational Capacity

Products	Production / Annum	Production Ratio	Annual Production (Units)	Initial Year Operational Capacity @60% (Units)
Capacitor				
Capacitor (2µF)	1,120,000	40%	448,000	268,800
Capacitor (2.5µF)		30%	336,000	201,600
Capacitor (3.5µF)		30%	336,000	201,600
		100%		
Resistors				
Resistor (3Ω)	1,120,000	40%	448,000	268,800
Resistor (5Ω)		30%	336,000	201,600
Resistor (10Ω)		30%	336,000	201,600
		100%		
Connectors				

Connector (PCB to PCB)		40%	448,000	268,800
Connector (wire to PCB)	1,120,000	30%	336,000	201,600
Connector (wire to wire)		30%	336,000	201,600
		100%		
Total			**3,360,000**	**2,016,000**

6. CRITICAL FACTORS

Following factors should be taken into account while making investment decision:

- Good technical knowhow and knowledge of the industry
- Availability of specialized workforce
- Knowledge of market demand and supply
- Government policies encouraging import over localization
- Selection of appropriate machinery and human resources
- Rigorous supervision of the production
- Ability to generate work orders through networking
- Assurance of timely order fulfillment and;
- Compliance with international quality control standards

7. GEOGRAPHICAL POTENTIAL FOR INVESTMENT

There are very few electronic capacitors,resistors and connectors manufacturing units in the country. Therefore, this industry may be set up near any large to medium cities where raw material, low-cost labor and industrial infrastructure is easily available. The ideal location for the project may be near large and medium cities such as Karachi, Lahore, Islamabad, Multan, Peshawar, Quetta, Sargodha, Faisalabad, Gujranwala, etc. In addition, there is a high demand for electrical components in larger cities due to a larger share of affluent population and use of electronic devices.

8. POTENTIAL TARGET MARKETS

Interconnects and Passive Components market size is expected to reach $250.6 billion by 2026 at a CAGR of 5.8% during the forecast period 2021-2026,[5] owing to the growing number of computing, communications, and consumer electronics (3C) applications; driving the passive and interconnect market. Passive components are the building blocks in all kinds of electronic devices and appliances. These components are part of electronic circuitry and constitute the backbone of industries such as computing, communications, and consumer electronics.

Moreover, growing trends of use of electronic components and optimization of processes in terms of costs and energy saving have led to the increase in advancements in the electronics sector. As a result, continuous innovation and introduction of advanced technologies in consumer electronics sector is thereby supplementing the growth of the overall passive and interconnecting components market worldwide.

[5] https://www.industryarc.com/Research/Interconnects-And-Passive-Components-Market-Research-505426

In Pakistan, a few formal units are operating in this sector which are producing capacitors. Resistors and connectors are being imported and are not manufactured in Pakistan. Hence, it is good investment opportunity to start local production of these components as the demand for these electrical components is a never ending one. These units are operating in Karachi, Lahore, Sargodha and Gujrat. The key players currently operating in this sector includes Fuji Capacitors, Amber Capacitors and Power Capacitors etc.

9. PROJECT COST SUMMARY

A detailed financial model has been developed to analyze the commercial viability of "Manufacturing Unit for Electronic Capacitors, Resistors and Connectors". 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.

9.2. Project Cost

Total cost of the project has been calculated to be PKR 34.58 million. The project will be financed through 100% Equity. Table 3 provides the details of the costs calculated for the proposed manufacturing unit.

Table 3: Project Cost

Description of Costs	Amount (PKR)	Reference
Land	-	9.2.1
Building / Infrastructure	2,356,920	9.2.2
Machinery & Equipment	22,926,550	9.2.3
Furniture & Fixtures	970,000	9.2.4
Office Equipment	1,009,000	9.2.5
Office Vehicle	1,151,400	9.2.6
Pre-operating Costs	890,140	9.2.7
Security against building	1,224,000	9.2.8
Total Capital Cost	**30,528,010**	
Working Capital		
Raw material inventory	2,691,325	
Upfront insurance payment	361,169	

Cash	1,000,000	
Working Capital	**4,052,495**	
Total Project Cost	**34,580,505**	

9.2.1. Land

The manufacturing unit will be established in a rented building to avoid the high cost of land. Suitable units for setting up a business 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 6,800 sq. ft. The required space breakup is shown in Table 4.

Table 4: Breakup of Space Requirement

Break-up of Land Area	% Break-up	Area (Sq. Ft.)
Raw Material Store	10%	700
Manufacturing Area	60%	4,100
Finished Goods Store	9%	600
Executive Office	2%	150
Accounts Office	2%	150
HR and Admin Office	2%	150
Sales and Marketing Office	6%	440
Electrical and Mechnical Workshop	4%	300
Washrooms	3%	210
Total Area	**100%**	**6,800**

9.2.2. Building

There will be no cost of building since the unit will be started in a rented premises. However, there will be a renovation cost; required to make the building usable for the business. The proposed project requires electricity load of 47 KW for which an electricity connection under the General Supply Tariff-Industrial will be required. Building rent of PKR 408,000 per month has been included in the operating cost. Building renovation cost is shown in Table 5.

Table 5: Building Renovation Cost

Cost Item	Unit of Measurement	Total Units	Cost/Unit (PKR)	Total Cost (PKR)
Labour Cost - Paint	Sq. Feet	14,198	10	141,980
Wall Racks - Production	No.	10	15,000	150,000

Wall Racks - Store Rooms	No.	10	10,000	100,000
Wall Racks - Offices	No.	8	10,000	80,000
Curtains	No.	8	5,000	40,000
Blinds	No.	4	5,000	20,000
Labor Cost - Tiles	Sq. Feet	1,100	300	330,000
Labor Cost - Tiles	Sq. Feet	1,100	30	33,000
Glass doors and Partitions	Sq. Feet	2,529	550	1,390,950
Labour Cost - Paint	Sq. Feet	14,198	10	141,980
Total				**2,356,920**

9.2.3. Machinery and Equipment

Table 6 provides details of machinery and equipment required for the project. Table 7 provides details of electrical and mechanical tool kit.

Table 6: Machinery and Equipment

Cost Item	Units	Unit Cost (PKR)	Total Cost (PKR)
Capacitor			
Capacitor Winding Machine (5 KW)	1	3,200,000	3,200,000
Thermal Press Machine (10 KW)	1	1,200,000	1,200,000
Zinc Spray Machine (0.3KW)	1	1,000,000	1,000,000
Spot Welding Machine (1.5KW)	1	500,000	500,000
Voltage Clearance Machine (8 KW)	1	800,000	800,000
LCR Meter (0.5KW)	1	60,000	60,000
Resistor			
Ceramic Powder Molding Hydraulic Press Machine (2KW)	1	1,000,000	1,000,000
Coil Winding Machine (1.5KW)	1	700,000	700,000
Marking Machine (0.5KW)	1	600,000	600,000
Spot Welding Machine (1.5KW)	1	350,000	350,000
Lead Cutting Machine (0.5KW)	1	100,000	100,000
LCR Meter (0.5KW)	1	60,000	60,000
Connectors			
Stamping Machine (2.5KW)	1	600,000	600,000

Electroplating Machine (1KW)	1	450,000	450,000
Injection Molding Machine (15KW)	1	10,000,000	10,000,000
Molds for Injection Molding	6	250,000	1,500,000
Assembling Machine (1.5KW)	1	450,000	450,000
Material Handling Trolleys	4	20,000	80,000
Weighing Scale	1	40,000	40,000
Plastic Baskets	20	1,000	20,000
Others			
Electric (static) Chain Pulley 500 kg	1	150,000	150,000
Electrical & Mechanical Tool Kits			66,550
Total Cost (PKR)			**22,926,550**

Table 7:Electrical and Mechanical Tool Kit

Cost Item	No.	Unit Cost (PKR)	Total Cost (PKR)
Electrical Tool Kit			
Wire strippers	5	780	3,900
Insulated screwdrivers	4	750	3,000
Insulated pliers	4	2,100	8,400
Electrical tape	10	60	600
Cable cutters	5	560	2,800
Spanners	3	160	480
Voltage tester	5	800	4,000
Safety knife	3	170	510
Hex keys	3	600	1,800
Claw Hammer	2	660	1,320
Tape Measure	5	350	1,750
Torch	5	300	1,500
Mechanical Tool Kit			
Screwdrivers	5	750	3,750
Wrenches	5	800	4,000
Pliers	5	2,100	10,500
Ratchet and Socket Sets	3	2,200	6,600

Allen Wrenches	2	2,890	5,780
Mechanical gloves	10	160	1,600
Multimeter	5	450	2,250
Digital Vernier Caliper	3	670	2,010
Total			**66,550**

9.2.4. Furniture & Fixtures

Table 8 provides details of the furniture and fixture requirement of the project.

Table 8: Furniture and Fixtures

Cost Item	No.	Unit Cost (PKR)	Total Cost (PKR)
Executive Tables	8	35,000	280,000
Executive Chairs	6	20,000	120,000
Office Tables	5	15,000	75,000
Office Chairs	21	10,000	210,000
Visitor Chairs	10	10,000	100,000
Sofa Set	3	35,000	105,000
Racks	10	8,000	80,000
Total			**970,000**

9.2.5. Office Equipment

Details of office equipment required for the project is provided in Table 9.

Table 9: Office Equipment

Cost Item	Units	Unit Cost (PKR)	Total Cost (PKR)
Laptop	6	80,000	480,000
Desktop Computer	10	25,000	250,000
Ceiling Fan	10	5,000	50,000
Exhaust Fan	13	1,000	13,000
Bracket Fan	4	7,000	28,000
Water Dispenser	2	20,000	40,000
Printer	2	40,000	80,000
CCTV Cameras	8	2,000	16,000
DVR	1	12,000	12,000

LED / LCD	2	15,000	30,000
Wi-Fi	2	5,000	10,000
Total Cost (PKR)	**60**		**1,009,000**

9.2.6. Office Vehicles

Details of office vehicles required for the project is provided in Table 10.

Table 10: Office Vehicles

Cost Item	Unit	Unit Cost (PKR)	Total Cost (PKR)
Motorcycle	1	90,000	90,000
Pickup	1	1,050,000	1,050,000
Registration Charges		1%	11,400
Total Cost (PKR)			**1,151,400**

9.2.7. Pre-Operating Cost

Details of pre-operating cost for the project are provided in Table 11.

Table 11: Pre-Operating Cost

Cost Item	Total Cost (PKR)
Administration expenses	720,000
Utilities expenses	170,140
Total	**890,140**

9.2.8. Security against Building

Detail of security against rented building for the project is provided in Table 12.

Table 12: Security against Building

Cost Item	Months	Unit Cost/Month (PKR)	Total Cost (PKR)
Security against Building	3	408,000	1,224,000

9.3. Financial Feasibility Analysis

The financial feasibility analysis given in Table 13 provides the information regarding projected IRR, NPV and payback period of the study based on 100% equity.

Table 13: Financial Feasibility Analysis

Description	Project
IRR	45%
NPV (PKR)	58,587,777
Payback Period (Years)	2.94
Projection Years	10
Discount Rate used for NPV	15%

9.4. Financial Feasibility Debt Financing

Table 14 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 14: Financial Feasibility Debt Financing

Description	Project
IRR	46%
NPV (PKR)	82,802,940
Payback Period (years)	2.91
Projection Years	10
Discount Rate used for NPV	16%

9.4.1. Breakeven Analysis

Breakeven analysis for "Manufacturing Unit for Electronic Capacitors, Resistors and Connectors" is provided in Table 15.

Table 15: Breakeven Analysis

Description	Amount First Year (PKR)	Ratios
Sales (PKR) – A	79,083,200	100%
Variable Cost (PKR) – B	50,496,669	64%
Contribution (PKR) (A-B) = C	28,586,531	36%
Fixed Cost (PKR) – D	22,077,481	28%
Breakeven Revenue (PKR)		61,076,241
Number of units at Breakeven (Fixtures)		1,556,964
Breakeven Capacity		46%

9.4.2. Revenue Generation

Based on the 60% capacity utilization of the unit, sales revenue during the first year of operations is estimated in Table 16. Finished goods inventory in the proposed project is assumed to be kept for 15 days.

Table 16: Revenue Generation

Product	Quantity Sold (Units)	Sale Price Per Unit (PKR)	Total Revenue (PKR)
Capacitor			
Capacitor (2µF)	257,600	85	21,896,000
Capacitor (2.5µF)	193,200	95	18,354,000
Capacitor (3.5µF)	193,200	105	20,286,000
Resistors			
Resistor (3Ω)	257,600	12	3,091,200
Resistor (5Ω)	193,200	14	2,704,800
Resistor (10Ω)	193,200	16	3,091,200
Connectors			
Connector (pcb to pcb)	257,600	15	3,864,000
Connector (wire to pcb)	193,200	15	2,898,000
Connector (wire to wire)	193,200	15	2,898,000
Total			**79,083,200**

9.4.3. Variable Cost Estimate

Variable costs of the project have been provided in detail in Table 17.

Table 17: Variable Cost Estimate

Variable Cost	Cost (PKR)
Material Cost (**Table 18**)	28,612,276
Packing Cost (**Table 22**)	2,447,200
Electricity	1,236,429
Direct Labour	14,280,000
Vehicle running and maintenance cost	409,500

Communications expense (phone, fax, mail, internet etc.)	723,600
Office expenses (stationery, entertainment, janitorial services, etc.)	1,206,000
Promotional expense	1,581,664
Total Variable Cost	**50,496,669**

Table 18: Material Cost

Product	Quantity Sold (Units)	Material Cost Per Unit (PKR)	Total Material Cost(PKR)
Capacitors		(Table 19)	
Capacitor (2µF)	257,600	32.78	8,444,128
Capacitor (2.5µF)	193,200	38.47	7,432,404
Capacitor (3.5µF)	193,200	49.86	9,632,952
Total			**25,509,484**
Resistors		(Table 20)	
Resistor (3Ω)	257,600	2.82	726,432
Resistor (5Ω)	193,200	3.07	593,124
Resistor (10Ω)	193,200	3.63	701,316
Total			**2,020,872**
Connectors		(Table 21)	
Connector (PCB to PCB)	257,600	1.68	432,768
Connector (wire to PCB)	193,200	1.68	324,576
Connector (wire to wire)	193,200	1.68	324,576
Total			**1,081,920**
Grand Total			**28,612,276**

Table 19: Raw Material Cost per Unit - Capacitor

Cost Item	Unit of Measurement	Raw Material Required / Per Unit (Kgs)			Price / Kg or Unit or Ft (PKR)	Price / Gram or Unit	Raw Material Cost / Per Unit (PKR)		
		Ratio (2μF)	Ratio (2.5μF)	Ratio (3.5μF)			Ratio (2μF)	Ratio (2.5μF)	Ratio (3.5μF)
		A	*B=(A/2)*2.5*	*C=(A/2)*3.5*		*D*	*E=A*D*	*F=B*D*	*G=C*D*
MPP Film (Metalized Polypropylene)	Grams	7.443	9.304	13.025	2,000	2	14.89	18.61	26.05
Epoxy Resin	Grams	4.276	5.345	7.483	1,000	1	4.28	5.35	7.48
Hardner	Grams	2.098	2.623	3.672	1,000	1	2.10	2.62	3.67
Zinc Spray	Mili-liter	1.026	1.283	1.796	700	0.7	0.72	0.90	1.26
Masking Tape	Ft	1	1	1	1	1	1.00	1.00	1.00
Terminal Wire	Pcs	2	2	2	2	2	4.00	4.00	4.00
Solder Wire	Grams	0.16	0.20	0.28	5,000	5	0.80	1.00	1.40
Capacitor Box	Pcs	1	1	1	5	5	5.00	5.00	5.00
Raw Material Cost / Unit							**32.78**	**38.47**	**49.86**

Table 20: Raw Material Cost per Unit - Resistor

Cost Item	Unit of Measurement	Raw Material Required / Per Unit (Kgs)			Price / Kg or Unit or Ft (PKR)	Price / Gram or Unit	Raw Material Cost / Per Unit (PKR)		
		Resistor (3Ω)	*Resistor (5Ω)*	*Resistor (10Ω)*			*Resistor (3Ω)*	*Resistor (5Ω)*	*Resistor (10Ω)*
		A	*B=(A/3)*5*	*C=(A/3)*10*		*D*	*E=A*D*	*F=B*D*	*G=C*D*
Resistance Wire (nickel-chromium alloy)	Grams	0.10	0.17	0.33	3,500	4	0.35	0.60	1.16
ceramic (Core)	Grams	1.50	1.50	1.50	300	0.3	0.45	0.45	0.45
vitreous enamel	Mili-liter	0.20	0.20	0.20	1,000	1	0.20	0.20	0.20
Caps	No.	2.00	2.00	2.00	1	1	1.00	1.00	1.00
Solder Wire	Grams	0.10	0.10	0.10	5,000	5	0.50	0.50	0.50
Epoxy Resin	Grams	0.30	0.30	0.30	1,000	1	0.30	0.30	0.30
Hardener	Grams	0.02	0.02	0.02	1,000	1	0.02	0.02	0.02
Raw Material Cost / Unit							**2.82**	**3.07**	**3.63**

Table 21: Raw Material Cost per Unit - Connectors

Cost Item	Unit of Measurement	Raw Material Required / Per Unit (Kgs)			Price / Kg or Unit or Ft (PKR)	Price /Gram or Unit or Ft	Raw Material Cost / Per Unit (PKR)		
		Connector (pcb to pcb)	*Connector (wire to pcb)*	*Connector (wire to wire)*			*Connector (pcb to pcb)*	*Connector (wire to pcb)*	*Connector (wire to wire)*
		A	*B*	*C*		*D*	*E=A*D*	*F=B*D*	*G=C*D*
PBT Plastic	Grams	1.00	1.00	1.00	400	0.4	0.40	0.40	0.40
Roll of metal tape (Copper)	Grams	0.15	0.15	0.15	2,500	2.5	0.38	0.38	0.38
Nickel	Grams	0.30	0.30	0.30	3,000	3.0	0.90	0.90	0.90
Raw Material Cost / Unit							**1.68**	**1.68**	**1.68**

Table 22: Packing Cost

Particular	Formula	Packing Cost per Unit (PKR)	Quantity Sold	Total Packing Cost (PKR)
Capacitor	(40/50)+2 (Table 23)	2.8	644,000	1,803,200
Resistor	(20/100)+(2/10) (Table 23)	0.4	644,000	257,600
Connector	(20/100)+(2/10) (Table 23)	0.6	644,000	386,400
Total				**2,447,200**

Table 23: Packaging Assumptions

	Cost Unit (PKR) - Capacitor	Cost Unit (PKR) – Resistor & COnnector
Poly Transparent Plastic Bag	2	2
Cartons	40	20

9.4.4. Fixed Cost Estimate

Table 24 provides details of fixed cost for the project.

Table 24: Fixed Cost Estimate

Fixed Cost	Cost (PKR)
Administration expense	12,060,000
Building rental expense	4,896,000
Electicity	438,049
Insurance expense	361,169
Depreciation expense	4,144,235
Amortization of pre-operating costs	178,028
Total	**22,077,481**

9.4.5. Human Resource Requirement

For the 1st year of operations, the Electronic Capacitors, Resistors and Connectors manufacturing unit shall require the workforce at a salary cost as projected in Table 25.

Table 25: Human Resource Requirement

Designation	No. of Persons	Average Monthly Salary(PKR)	Total Salary(PKR)
Owner	1	200,000	2,400,000
Electronics Engineer	1	140,000	1,680,000
Associate Engineer	2	70,000	1,680,000
HR and Admin Manager	1	70,000	840,000
Assistant HR and Admin	1	50,000	600,000
Accounts and Finance Manager	1	70,000	840,000
Assistant Accounts	1	50,000	600,000
Manager Sales and Marketing	1	90,000	1,080,000
Assistant Sales and Marketing	2	50,000	1,200,000
Quality Manager	1	70,000	840,000
Quality Officer	1	50,000	600,000
Electrical Technician	1	50,000	600,000
Mechanical Technician	1	50,000	600,000
Machine Operators	12	40,000	5,760,000
Helpers	6	35,000	2,520,000

Store Incharge	2	45,000	1,080,000
Store Helper	2	35,000	840,000
Driver	1	35,000	420,000
Office Boy	2	30,000	720,000
Security Guard	4	30,000	1,440,000
Total	**44**		**26,340,000**

10. CONTACT DETAILS

Details of suppliers of Machinery and Equipment are provided in Table 26.

Table 26: Contact Details of Suppliers

Supplier Name	**Origin**	**Product**	**Contact Details**	**Website**
High-tech Machinery	Lahore, Pakistan	Machinery	0315-4782666	www.hitech-machinery.com/
Shijiazhuang Forever Machinery	China	Machinery	0086-311-83839996	www.tubemills.cn/
Prime Mechanical Works (PVT) Ltd	Karachi/ Lahore,	Machinery	04235923024 03008443167	www.primemachines.net
Qingdao fullwin Plastic machinery	China	Machinery	0086-15254294721	www.fullwinmachinery.en.alibaba.com/
Tasco	Islamabad	Carbon Powder / Graphite		https://pakistan.tradeford.com/pk637428/
Mazhar International	Pakistan	Carbon Powder / Graphite		https://mazharnisa.en.ec21.com/
Quality Polypack Printers (Private) Limited.	Karachi	MPP Film	(92-21) 2572862	http://www.qualitypolypackprinterspvtltd.enic.pk/
Epoxy Industries	Karachi	Epoxy Resin	021 35000616	https://www.epoxy.com.pk/
The Epoxy Resin	Pakistan	Epoxy Resin	03363860336	https://theepoxyresin.com/

11. USEFUL LINKS

Table 27: Useful Links

Organization	Website
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 Industries and Production	www.moip.gov.pk
Government of Punjab	www.punjab.gov.pk
Government of Sindh	www.sindh.gov.pk/
Government of Balochistan	www.balochistan.gov.pk/
Government of Khyber Pakhtunkhwa	www.kp.gov.pk/
Industries Department Government of Khyber Pakhtunkhwa	www.industries.kp.gov.pk
Industries and Commerce Department Sindh	www.industries.sindh.gov.pk
Department of Industries and Commerce, Azad Jammu and Kashmir	www.industries.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
Punjab Small Industries Corporation (PSIC)	www.psic.gop.pk
Sindh Small Industries Corporation (SSIC)	www.ssic.gos.pk/
Small Industries Development Board Khyber Pakhtunkhwa (KPSIDB)	www.small_industries_de.kp.gov.pk/
Industries and Commerce Department Balochistan (ICDB)	www.dgicd.gob.pk/
Azad Kashmir Small Industries Corporation (AJKSIC)	www.sic.ajk.gov.pk/
Pakistan Electronics Manufacturers Association - PEMA	www.pema.org.pk/
Technology Information Services (TIS)	https://www.pastic.gov.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										
Capacitors	60,536,000	73,945,464	86,139,600	100,017,436	115,551,139	133,143,182	152,257,979	174,431,883	199,056,326	215,712,000
Resistors	8,887,200	10,739,871	12,584,824	14,575,405	17,069,039	19,658,088	22,426,373	25,480,007	29,059,318	32,032,000
Connectors	9,660,000	11,610,672	14,069,988	15,915,673	18,767,007	20,892,652	24,136,008	27,603,342	31,294,648	34,720,000
	79,083,200	96,296,007	112,794,412	130,508,514	151,387,185	173,693,922	198,820,360	227,515,232	259,410,292	282,464,000
Cost of sales										
Material Cost										
Raw Material Cost-Capacitors	25,509,484	31,129,661	36,316,208	42,148,050	48,695,018	56,042,646	64,274,186	73,485,401	83,780,252	90,926,080
Raw Material Cost-Resistors	2,020,872	2,463,639	2,878,094	3,338,103	3,856,173	4,438,739	5,091,692	5,820,058	6,638,936	7,202,720
Raw Material Cost-Connectors	1,081,920	1,320,714	1,539,882	1,784,231	2,064,371	2,374,165	2,725,358	3,121,301	3,554,178	3,852,800
Packing Material Cost	2,447,200	2,982,491	3,478,414	4,045,932	4,673,878	5,375,110	6,174,795	7,049,469	8,047,195	8,724,800
Direct Electricity Cost	1,236,429	1,236,429	1,236,429	1,236,429	1,236,429	1,236,429	1,236,429	1,236,429	1,236,429	1,236,429
Direct Labour	14,280,000	15,322,440	16,440,978	17,641,170	18,928,975	20,310,790	21,793,478	23,384,402	25,091,463	26,923,140
Vehicle maintenance and running cost	409,500	445,536	484,743	527,401	573,812	624,307	679,246	739,020	804,054	874,810
Total cost of sales	46,985,405	54,900,910	62,374,748	70,721,314	80,028,656	90,402,187	101,975,184	114,836,080	129,152,507	139,740,779
Gross Profit	32,097,795	41,395,097	50,419,664	59,787,200	71,358,529	83,291,735	96,845,176	112,679,152	130,257,785	142,723,221
General administration & selling expenses										
Administration expense	12,060,000	12,940,380	13,885,028	14,898,635	15,986,235	17,153,230	18,405,416	19,749,011	21,190,689	22,737,610
Building rental expense	4,896,000	5,385,600	5,924,160	6,516,576	7,168,234	7,885,057	8,673,563	9,540,919	10,495,011	11,544,512
Indirect Electicity Cost	438,049	438,049	438,049	438,049	438,049	438,049	438,049	438,049	438,049	438,049
Communications expense (phone, fax, mail, internet etc.)	723,600	776,423	833,102	893,918	959,174	1,029,194	1,104,325	1,184,941	1,271,441	1,364,257
Office expenses (stationery, entertainment, janitorial services, etc	1,206,000	1,294,038	1,388,503	1,489,863	1,598,624	1,715,323	1,840,542	1,974,901	2,119,069	2,273,761
Promotional expense	1,581,664	1,925,920	2,255,888	2,610,170	3,027,744	3,473,878	3,976,407	4,550,305	5,188,206	5,649,280
Insurance expense	361,169	306,994	252,818	198,643	144,468	90,292	36,117	624,566	530,881	437,196
Depreciation expense	4,144,235	4,144,235	4,144,235	4,144,235	4,144,235	4,144,235	2,841,387	6,990,097	6,990,097	6,990,097
Amortization of pre-operating costs	178,028	178,028	178,028	178,028	178,028	-	-	-	-	-
Subtotal	25,588,745	27,389,666	29,299,811	31,368,117	33,644,789	35,929,258	37,315,806	45,052,789	48,223,443	51,434,761
Operating Income	6,509,050	14,005,430	21,119,853	28,419,082	37,713,740	47,362,477	59,529,371	67,626,364	82,034,342	91,288,460
Gain / (loss) on sale of machinery & equipment	-	-	-	-	-	-	5,731,638	-	-	
Gain / (loss) on sale of office equipment	-	-	-	-	-	-	252,250	-	-	
Gain / (loss) on sale of office vehicles	-	-	-	-	-	-	287,850	-	-	
Earnings Before Interest & Taxes	6,509,050	14,005,430	21,119,853	28,419,082	37,713,740	47,362,477	65,801,108	67,626,364	82,034,342	91,288,460
Subtotal	-	-	-	-	-	-	-	-	-	-
Earnings Before Tax	6,509,050	14,005,430	21,119,853	28,419,082	37,713,740	47,362,477	65,801,108	67,626,364	82,034,342	91,288,460
Tax	1,398,167	4,021,900	6,511,948	9,066,678	12,319,808	15,696,866	22,150,387	22,789,227	27,832,019	31,070,960
NET PROFIT/(LOSS) AFTER TAX	**5,110,883**	**9,983,530**	**14,607,905**	**19,352,404**	**25,393,931**	**31,665,611**	**43,650,721**	**44,837,137**	**54,202,323**	**60,217,499**

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											
Current assets											
Cash & Bank	1,000,000	4,246,140	10,666,210	17,355,665	24,051,157	31,048,748	37,970,963	42,277,961	89,827,321	146,792,011	232,659,035
Accounts receivable		6,499,989.04	7,914,740.30	9,270,773.59	10,726,727.18	12,442,782.33	14,276,212.77	16,341,399.45	18,699,882.08	21,321,393.86	23,216,219.18
Consumables Inventory											
Raw material inventory	2,691,325	3,548,053	4,483,334	5,640,282	7,067,655	8,825,561	10,989,367	13,642,341	16,895,435	19,928,522	-
Pre-paid building rent	-	448,800	493,680	543,048	597,353	657,088	722,797	795,077	874,584	962,043	-
Pre-paid insurance	361,169	306,994	252,818	198,643	144,468	90,292	36,117	624,566	530,881	437,196	-
Total Current Assets	4,052,495	15,049,976	23,810,783	33,008,412	42,587,360	53,064,471	63,995,457	73,681,344	126,828,103	189,441,165	255,875,254
Fixed assets											
Land	-	-	-	-	-	-	-	-	-	-	-
Building / Infrastructure	2,356,920	2,121,228	1,885,536	1,649,844	1,414,152	1,178,460	942,768	707,076	471,384	235,692	-
Machinery & equipment	22,926,550	19,487,568	16,048,585	12,609,603	9,170,620	5,731,638	2,292,655	39,292,078	33,398,266	27,504,454	21,610,643
Electrical and mechanical tool kits	-	-	-	-	-	-	-	-	-	-	-
Furniture & fixtures	970,000	824,500	679,000	533,500	388,000	242,500	97,000	1,662,410	1,413,048	1,163,687	914,325
Office vehicles	1,151,400	978,690	805,980	633,270	460,560	287,850	115,140	2,345,630	1,993,786	1,641,941	1,290,097
Office equipment	1,009,000	857,650	706,300	554,950	403,600	252,250	100,900	1,729,249	1,469,861	1,210,474	951,087
Security Against Building	1,224,000	1,224,000	1,224,000	1,224,000	1,224,000	1,224,000	1,224,000	1,224,000	1,224,000	1,224,000	1,224,000
Total Fixed Assets	29,637,870	25,493,636	21,349,401	17,205,167	13,060,932	8,916,698	4,772,463	46,960,442	39,970,345	32,980,248	25,990,151
Intangible assets											
Pre-operation costs	890,140	712,112	534,084	356,056	178,028	-	-	-	-	-	-
Legal, licensing, & training costs	-	-	-	-	-	-	-	-	-	-	-
Total Intangible Assets	890,140	712,112	534,084	356,056	178,028	-	-	-	-	-	-
TOTAL ASSETS	**34,580,505**	**41,255,723**	**45,694,268**	**50,569,635**	**55,826,320**	**61,981,169**	**68,767,920**	**120,641,787**	**166,798,449**	**222,421,414**	**281,865,406**
Liabilities & Shareholders' Equity											
Current liabilities											
Accounts payable		4,119,777	4,844,277	5,550,435	6,350,266	7,255,924	8,282,239	9,446,982	10,766,506	12,187,149	11,413,641
Other liabilities											
Total Current Liabilities	-	4,119,777	4,844,277	5,550,435	6,350,266	7,255,924	8,282,239	9,446,982	10,766,506	12,187,149	11,413,641
Shareholders' equity											
Paid-up capital	34,580,505	34,580,505	34,580,505	34,580,505	34,580,505	34,580,505	34,580,505	41,638,908	41,638,908	41,638,908	41,638,908
Retained earnings		2,555,442	6,269,486	10,438,696	14,895,550	20,144,741	25,905,176	69,555,897	114,393,034	168,595,357	228,812,856
Total Equity	34,580,505	37,135,946	40,849,991	45,019,200	49,476,054	54,725,245	60,485,680	111,194,805	156,031,942	210,234,265	270,451,764
TOTAL CAPITAL AND LIABILITIES	**34,580,505**	**41,255,723**	**45,694,268**	**50,569,635**	**55,826,320**	**61,981,169**	**68,767,920**	**120,641,787**	**166,798,449**	**222,421,414**	**281,865,406**

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
Operating activities											
Net profit		5,110,883	9,983,530	14,607,905	19,352,404	25,393,931	31,665,611	43,650,721	44,837,137	54,202,323	60,217,499
Add: depreciation expense		4,144,235	4,144,235	4,144,235	4,144,235	4,144,235	4,144,235	2,841,387	6,990,097	6,990,097	6,990,097
amortization of pre-operating costs		178,028	178,028	178,028	178,028	178,028	-	-	-	-	-
Accounts receivable		(6,499,989)	(1,414,751)	(1,356,033)	(1,455,954)	(1,716,055)	(1,833,430)	(2,065,187)	(2,358,483)	(2,621,512)	(1,894,825)
Finished goods inventory		-	-	-	-	-	-	-	-	-	-
Equipment inventory	-	-	-	-	-	-	-	-	-	-	-
Raw material inventory	(2,691,325)	(856,727)	(935,282)	(1,156,948)	(1,427,373)	(1,757,906)	(2,163,806)	(2,652,974)	(3,253,094)	(3,033,087)	19,928,522
Pre-paid building rent	-	(448,800)	(44,880)	(49,368)	(54,305)	(59,735)	(65,709)	(72,280)	(79,508)	(87,458)	962,043
Advance insurance premium	(361,169)	54,175	54,175	54,175	54,175	54,175	54,175	(588,449)	93,685	93,685	437,196
Accounts payable		4,119,777	724,500	706,157	799,831	905,658	1,026,316	1,164,742	1,319,525	1,420,642	(773,507)
Other liabilities		-	-	-	-	-	-	-	-	-	-
Cash provided by operations	(3,052,495)	5,801,582	12,689,555	17,128,151	21,591,042	27,142,331	32,827,391	42,277,961	47,549,360	56,964,690	85,867,024
Financing activities											
Additions to Working Capital Loan	-	-	-	-	-	-	-	-	-	-	-
Issuance of shares	34,580,505	-	-	-	-	-	-	7,058,404	-	-	-
Purchase of (treasury) shares											
Cash provided by / (used for) financing activities	34,580,505	-	-	-	-	-	-	7,058,404	-	-	-
Investing activities											
Capital expenditure	(30,528,010)	-	-	-	-	-	-	(45,029,366)	-	-	-
Acquisitions											
Cash (used for) / provided by investing activities	(30,528,010)	-	-	-	-	-	-	(45,029,366)	-	-	-
NET CASH	1,000,000	5,801,582	12,689,555	17,128,151	21,591,042	27,142,331	32,827,391	4,306,999	47,549,360	56,964,690	85,867,024

13. KEY ASSUMPTIONS

13.1. Operating Cost Assumptions

Table 28: Operating Cost Assumptions

Description	Details
Inflation rate	10.1%
Electricity growth rate	9.0%
Machinery maintenance cost (% of machinery cost)	5.0%
Communications expense (% of administration expense)	6%
Promotional expense (% of revenue)	2%
Office equipment price growth rate	9.6%
Office vehicles price growth rate	6.2%

13.2. Revenue Assumptions

Table 29: Revenue Assumptions

Description	Details
Sale price growth rate	10.1%
Initial capacity utilization	60%
Capacity growth rate	10%
Maximum capacity utilization	100%

13.3. Financial Assumptions

Table 30: Financial Assumptions

Description	Details
Project life (Years)	10
Debt: Equity	0:100
Discount Rate used for NPV	20%

13.4. Cash Flow Assumptions

Table 31 Cash Flow Assumptions

Description	Days
Account Receivable Days	30
Account Payable Days	30
Raw material Inventory Days	30
Finished Goods Inventory Days	15

13.5. Debt Related Assumptions

Table 32: Debt Related Assumptions

Description of Cost	Details
Project Life (Years)	10
Debt: Equity	50:50
Discount Rate	16%
Debt Tenure	5 years
Grace Period	1 Year
Interest Rate (KIBOR+3%)	10.3%

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