Pre-feasibility Study

ELECTRIC/TELE PHONE/OTHER COPPER-BASED CABLES MANUFACTURING UNIT

April 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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1. DISCLAIMER

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For information	helpdesk.punjab@smeda.org.pk

2. EXECUTIVE SUMMARY

Electric, telephone or other copper-based cables are used to connect two or more devices/points to transfer electrical signals or power from one device/point to the other. Different types of cables are used for different purposes. Cables are also used extensively in electronic devices for power transmission and signal circuits.

This "Pre-feasibility Document" provides details for setting up an "Electric/Telephone/Other Copper-based Cables Manufacturing Unit", which has a capacity of manufacturing 7,840 rolls (each roll consists of 90 meter) 2.5mm^2 single core[1] copper wire in a year at a maximum capacity of 90%. The initial capacity utilization in Year One is assumed to be 50%, which means 3,920 rolls of 90-meter wire production annually. The operational capacity of the unit is expected to grow with 10% and will obtain a maximum capacity of 90% in 5th year of its operations.

The unit is proposed to be ideally located in Karachi, Lahore or Islamabad. These areas are preferred for the proposed unit due to their proximity to raw material, market and availability of skilled labor.

The unit will be set up in a rented building with an area of 4,500 sq. ft. (1 Kanal). The project requires a total investment of PKR 13.54 million. This includes capital investment of PKR 11.11 million and working capital of PKR 2.43 million. This project is financed through 100% equity. The Net Present Value (NPV) of project is PKR 85.87 million with an Internal Rate of Return (IRR) of 83% and a Payback period of 1.67 years. Further, this project is expected to generate gross annual revenue of PKR 45,08 million in first year of operations, average Gross Profit (GP) ratio ranging from 39% to 45% and Net Profit (NP) ratio ranging from 15% to 23% during the projection period of ten years. The proposed project will achieve its estimated breakeven point at capacity of 22% at breakeven revenue of PKR 20.43 million during first year.

The proposed project may also be established using leveraged financing. At 50% financing at a cost of KIBOR+3%, the proposed unit provides Net Present Value (NPV) of PKR 106.32 million, Internal Rate of Return (IRR) of 83% and Payback period of 1.67 years. Further, this project is expected to generate Net Profit (NP) ratio ranging from 14% to 24% during the projection period of ten years. The proposed project will achieve its estimated breakeven point at capacity of 24% with breakeven revenue of PKR 22.73 million.

The proposed project will provide employment opportunities 23 people. Favorable return on investment and steady growth of business is expected from the very first year of operation. Hence it may be assumed that proposed business is economically and financially viable. The legal business status of this project is proposed as "Private Limited

[1] A single core cable/wire has one conductor. 2.5 mm^2 is the cross-sectional area of conductor.

Company". However, it may also be a sole proprietorship or partnership.

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 'sectorial 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 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 setting up an "Electric/Telephone/Other Copper-based Cables Manufacturing Unit". The document provides a general understanding of the business to facilitate potential

investors in crucial and effective investment decisions.

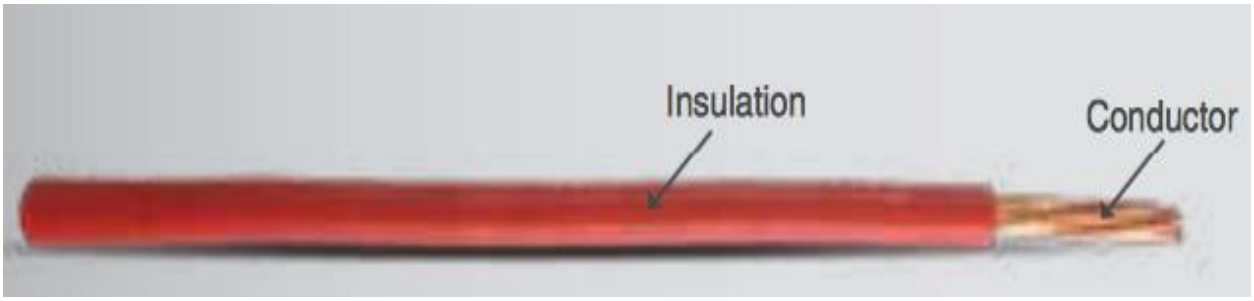
The need to come up with pre-feasibility reports for undocumented or minimally documented sectors attains greater imminence as the research that precedes such reports reveal certain thumb rules; best practices developed by existing enterprises by trial and error, and certain industrial norms that become a guiding source regarding various aspects of business set-up and its successful management.

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

5. BRIEF DESCRIPTION OF PROJECT & PRODUCT

Electricity is an essential part of modern-day life. It is used for lighting, heating, cooling, and refrigeration and for operating home electrical and electronic appliances, computers, machinery and equipment and public transportation systems. Electric current flows when free electrons move from atom to atom in a material. Materials that permit free flow of electrons are called conductors. Copper, silver, gold, aluminum and iron are good conductors of electricity. Copper and aluminum are most commonly used as the conductors in electrical cables. The conductors are insulated to allow efficient and safe flow of electrons. Figure 1 shows a typical electrical cable showing the conductor and the insulator.

Figure 1: Electrical Cable Showing Conductor and Insulator



5.1 Cables

5.1.1 Products

There are several types of cables, differing with respect to-usage, type of conductor and the intended use (for household, industrial use, or transmission purpose).

The specifications of the cables used for general wiring are shown in Table 1.

Table 1: Cables - Types and Usages

Product	Specifications	Range
GENERAL WIRING	450/750V & 300/500V	a) SINGLE CORE[2] (PVC Insulated)
	BS-6004, BS-50525, BS-6500	1 mm^2 to 630 mm^2
		b) SHEATHED[3] CABLES
		Single Core 1 mm^2 to 10 mm^2
		Multi Core 1 $mm^2$to 10 mm^2

There are two types of cables i.e., SINGLE CORE (PVC Insulated) and b) SHEATHED CABLES. SHELTED cables are further categorized into single core 1mm^2 to 10 mm^2 and Multi core 1 mm^2 to 10 mm^2.

The specifications of the cables used in multiple sectors e.g., Cement, Chemical, Textile, Oil & Gas, Process Automation, Airports, Railways, Metros, Sugar Industry, and similar other projects are shown in Table 2.

Table 2: Specifications of the cables

L.V. CABLES	600/1000V & 1900/3300V	a) SINGLE CORE
		16 mm2 to 1000 mm2
Copper or Aluminum	BS-6346	Armoured[4] / Unarmoured / Screened
Conductor XLPE or	BS-5467	
PVC Insulated	IEC-60502-1	b) MULTI CORE
		16 $mm^2$to 400 mm^2
		Armoured / Unarmoured / Screened

Armoured Cables, commonly known as SWA cable, the steel wire armoured cable is a power and auxiliary control cable, designed for use in mains supply electricity. Unarmoured cables are used inside walls and in other protected locations. The specifications of the cables used as primary cables by the utility companies for distribution

[2] Single core cables have one conductor and multi core cables have as many conductors.
[3] Sheathed cables are protected by an enclosing web of earthed wire mesh or metal foil.
[4] Armoured cables have an additional protective coating/layer.

to Sub-Station and Industrial Projects are shown in Table 3.

Table 3: Cables used by utility companies

M.V. CABLES	11000 -15000 V	a) SINGLE CORE
Copper or Aluminum		16 mm^2 to 630 mm^2
Conductor, XLPE Insulated	IEC-502, IEC-60502-2	Armoured/ Unarmoured
		b) MULTI CORE
		16 mm^2 to 400 mm^2
		Armoured/ Unarmoured

The specifications of the cables used in Hotels, Commercial Buildings, Hospitals, shopping malls, Cinemas, Airports, Mass Transit, Ships, Data Centers and Similar Public Places are shown in Table 4.

Table 4: Cables used in commercial buildings

LOW SMOKE ZERO HALOGEN		
(LSZH) CABLES		
General Wiring		
a) LSZH Insulated 70°C	BS EN-50525-3-31 450 / 750 V	1.5 mm^2 to 630 mm^2
b) Xl-HFFR Insulated 90°C	BS EN-50525-3-41 450 / 750 V	1.5 mm^2 to 630 mm^2
LV CABLE		
Copper Or Aluminum	IEC-60502-1, 600/1000V	a) SINGLE CORE
Conductor XLPE Insulated		1.5 mm^2 to 1000 mm^2
LSZH Sheathed		Armoured / Unarmoured
		MULTI CORE
		1.5 mm^2 to 400 mm^2
		Armoured / Unarmoured

The specifications of the cables used in Multiple sectors e.g. Cement, Chemical, Textile, Oil & Gas, FMCG, Process Automation, Airports, Railways, Metros, Sugar Industry, and similar other projects are shown in Table 5.

Table 5: Cables used in industrial sector

ENHANCED FIRE RETARDENT CABLES		
Copper Or Aluminium	IEC-60502-1, 600/1000V	a) Single & Multi Core Cable
Conductor XLPE Insulated	IEC-60332-3-22, CAT-A	1.5 $mm^2$to 400 mm^2
LSZH Sheathed	IEC-60332-3-24, CAT-C	Armoured/ Unarmoured

Cables used in Industrial Control Wiring, Telecommunications, Automotive Industry is shown in Table 6.

Table 6: Cables used in Telecommunication Industry

Product	Specifications	Range
CONTROL CABLES	600/1000 V	MULTI CORE
Copper Conductor	BS-6346, IEC-60502-1	1.5 $mm^2$to 4.0 mm^2
XLPE OR PVC Insulated, PVC Sheathed		
TELEPHONE /INTERCOM CABLES	PCL Design	1 pair to 5 pairs
PE INSULATED		Unarmored
AUTO MOBILE CABLES	JIS-D611, C-3406	Different types & sizes as per customer's requirements

The specifications of some SPECIAL CABLES are shown in Table 7.

Table 7: Special Cables

Product	Specifications	Range	Usage
a) AIR FIELD LIGHTING CABLE	Civil Aviation Authority	As per customer requirements	Airport lighting
b) COAXIAL CABLES	5C - 2V 75ohm, RG-6, RG-11	As per customer specifications	Dish Antenna CC TV and cable wiring
c) SUBMERSIBLE CABLES	BS-6004, Customer Specification	All sizes as per customer requirements	Water submersible pumps

d) MISCELLANEOUS	As per Customer Specifications	As per customer requirements	As per customer requirements and usage

Table 8: Other Cables

OTHER CABLES			
Product	**Specifications**	**Range**	**Usage**
CONDUCTORS			
PACC: Plain Annealed Copper Conductor	BS-6360, BS EN-60228	Up to 1000 mm2	Earthing Conductor
HDBC: Hard Drawn Bare Conductor	BS-7884	Up to 400 $mm^2$and above sizes as per customer requirement	Overhead Transmission Lines
ACSR: Alum Conductor Steel Reinforced	BS-215, ASTM B-232, IEC-61089	Up to 1250 mm^2	
AAC: All Alum Conductor	BS-215, ASTM B-231, BS-50182, IEC-61089	Up to 865 $mm^2$and above sizes as per customer requirement	
ACCC: Alum Conductor Composite Core	ASTM B-857	Up to ACCC drake and above size as per customer requirement	
HIGH CONDUCTIVITY OXYGEN FREE COPPER ROD	ASTM B-49	8mm Dia	Electrical & Enamel wire manufacturing Distribution/Installation & communication wires

The specifications of the cables Used in Architectural, Industrial & Commercial Applications are shown in Table 9.

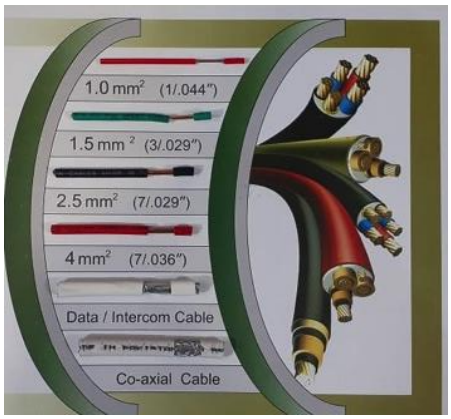
Table 9: Specifications of Cables

Product	Specifications	Range
ALUMINIUM SECTION	BS-1474, ASTM-B221,	a) Sections for sliding doors and windows
(Profiles)	BS-3987 & AAMA CLASS-1	b) Sections for hinged doors and windows
Alum-Ex		c) Sections for fixed glazing/shop fronts
Brand		d) Sections for double glazed sliding Doors and Windows
Anodized as Well as Powder Coated		e) Sections for double glazed open able Doors and Windows and Glass door sections
		f) Curtain wall sections/Structural glazed sections
		g) Centrally pivoted window sections
		h) Swing door sections
		i) Sections for casement/awning windows
		j) False ceiling sections
		k) Special sections to suit customer's

Source: http://www.pakistancables.com/media/20877/ct-2020-final.pdf

Figure 2 shows pictorial view of few wires.

Figure 2: Wiring Cables



1.0 mm^2, 1.5mm^2 ,2.5mm^2 ,4mm^2 shows measurement of cross-sectional area of conductors and 1/0.44", 3/0.29" and 7/0.29' shows number and nominal diameter of wires in the cable based on Imperial Sizes BSS-2004. Data/ intercom and Coaxial cables are often used for device-to-device connections by cable operators, internet service providers and telephone companies. The central axis of the coaxial cable is a copper wire, plus a layer of insulating material. Basic difference between wire and cable is that the wire basically consists of multiple conductors while cable consist of just singe conductor.

5.1.2 Characteristics

Taking cost into consideration copper and aluminum are mostly used as conductors. Table 10 and Table 11 provide details of their electrical and physical properties these conductors.

Table 10: Electrical Properties

Metal	Relative conductivity[5] (Copper = 100)	Electrical resistivity[6] at 20C x10-8 Ωm
Copper (HC, annealed)	100	1.724
Copper (HC, hard drawn)	97	1.777
Copper (HC, Oxygen free, annealed)	100	1.724
Aluminum (EC grade Semi Hard)	61.5	2.803

[5]Conductivity is the measure of the ability of the metal to pass the electric current.
[6] Opposite of conductivity

Aluminum (EC grade Hard)	61.4	2.808

Table 11: Physical Properties

Parameters	Unit	Copper	Aluminum
Density at 20 degrees Celsius	Kg/m3	8890	2703
Coefficient of thermal expansion per degree Celsius	$(x10)^{-5}$	17	23
Melting Point	Degree Celsius	1083	659
Thermal conductivity	watts per meter-kelvin (W/m k)	401	239
Ultimate Tensile Stress Soft	Newton per meter square ($N/m^{2)}$	225	70 – 90
Ultimate Tensile Stress Hard	Newton per meter square (N/m^2)	385	125 – 205
Elastic Modulus	Newton per meter square (N/m^2)	26	14

5.1.3 Color Codes

Electrical engineers, contractors, traders, manufacturers and especially electricians around the world use different electrical wiring color codes for cable and wire installation and electricity distribution in industrial buildings or residential homes. Some of the power wires and cables color codes are mandatory while others are optional. The proper wiring color codes used in the installations is a best strategy for quickly identifying lines, neutral and ground wire tracing, time-saving, easy maintenance/troubleshooting and protection for those who are working on it.

There are multiple colors used for different wires and cables in different regions for AC (alternating current) Single-Phase, Three-Phase and DC (Direct Current) for design and installation based on the local codes, rules and regulations. Some of the well-known are NEC “National Electrical Codes” followed by US and Canada while IEC “International Electro technical Commission” followed by Britain and other European Union countries. Figure 3 shows electrical wiring color codes used in different countries around the world.

Figure 3: Electric Wire - Color Codes

5.1.4 The Project

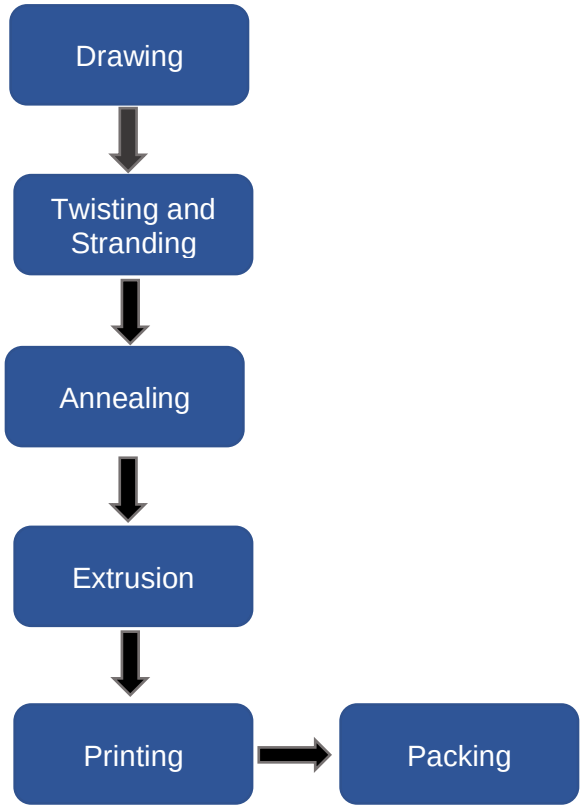
The document provides details for setting up an Electric/Telephone/Other Copper-based Cables Manufacturing Unit. It has been assumed that the unit is producing 2.5 mm^2 Single Core Copper, Polyvinylchloride (PVC) coated electric wire, which is heavily used in domestic and commercial wiring. The unit requires updated technology in respect of production machinery, which includes Drawing Machine, Annealing Machine, Bunching Machine and Extruder.

The proposed unit is to be set up in a rented building having covered area of 4,500 sq. ft. The project shall operate at 50% of installed capacity in the first year of operation producing 3,920 wires rolls of 90-meter cable/wire each. The proposed project is expected to attain a maximum capacity of 90% in fifth year of operation. Having the facility to serve the local market, the proposed business will create employment opportunities for 20 to 25 persons. Financial analysis shows the unit shall be profitable from the first year of operation.

5.2 Production Process Flow

The production process flow is as follows:

Figure 4: Production Process Flow



The brief description of process flow is as follows:

Raw Materials

Main raw materials used in wire/ cable manufacturing are copper and Polyvinyl Chloride (PVC) for cable and wire manufacturing. Ink and additives are used for printing purposes. Bundles of copper wires can be purchased from market along with Polyvinyl Chloride.

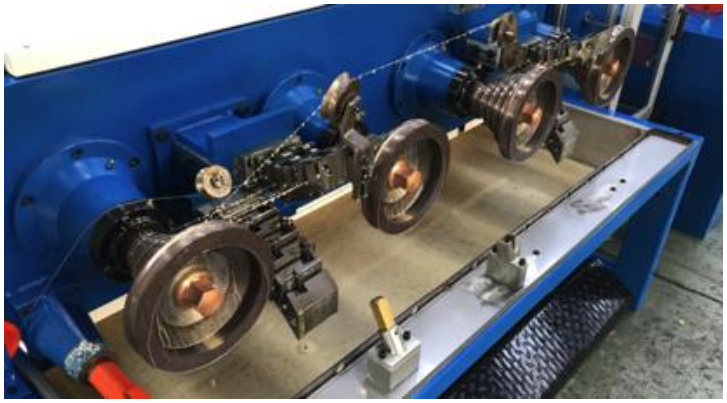
The main difference between copper and aluminum is conductivity, which is 100 for copper and 61 for aluminum, which indicates copper is a better conductor than aluminum. Further copper is more durable and stable than aluminum. Mostly copper is used in domestic wirings because of the mentioned reasons. Aluminum is used in high-tension lines due to its lighter weight as compared to copper wires.

Drawing

This is the first stage of the wire manufacturing process, wherein the diameter of a wire is gradually reduced to the pre-set value. For wire manufacturing (Copper or Aluminum),

tremendous pressure is applied to form a thinner wire on metal rod. Figure 5 shows wire drawing machine.

Figure 5: Wire Drawing Machine



Twisting and Stranding

In this step, two or more wires of the same gauge are twisted or stranded together using a proprietary formula to determine twist length. Figure 6 shows wire-twisting machine.

Figure 6: Wire Twisting Machine

Annealing

This is the process of heat-treating the wire, which is done to improve the wire's physical properties like conductivity and ductility. After getting extremely brittle and easily fractured, the wire is heated to its recrystallization temperature for a specified time to make it soft or anneal the wire. The key point during the process is to avoid oxidation of the wire. If copper is oxidized it will turn into copper oxide which is not a conductor and thus affects the performance of the cable. Figure 7 shows an annealing machine.

Figure 7: Annealing Machine

Extrusion

After annealing, the wire is passed through an extruder, where a coating of plastic or other insulating material is applied on the conductor. The choice of this material depends upon the requirements needed by the wire. Exiting the extruder, the coated wire passes through another cooling system and is coiled on reels. An extruding machine is shown in Figure 8.

Figure 8: Extruder

Printing

Tags like batch number, voltage, gauge, length and other specifications are printed on the cable for identification and information. Figure 9 shows a modern label printer.

Figure 9: Printing Machine

Packing

Finished form of cables are packed and labeled for final delivery. Figure 10 shows finished products ready for dispatch.

Figure 10: Wire Coil

5.3 Installed and Operational Capacities

The proposed manufacturing unit at maximum capacity of 90% shall produce 7,840 rolls of 90 meters annually. The unit would operate in a single shift of 8 hours per day for 280 working days in a year During first year of operation, the manufacturing unit is expected to achieve 50% of its installed capacity.to produce 3,920 rolls of 90 meters.

Table 12 depicts installed and operational capacities of the proposed unit.

Table 12: Installed and Operational Capacity

Product	Production Capacity per day (90-meter Rolls)	Capacity per Year (90-meter Rolls)	Initial capacity Utilization @50 % (90-meter Rolls)
Copper wire (2.5 mm diameter)	28	7,840	3,920

6. CRITICAL FACTORS

Wires have a wide range of application, not only in industrial sector but also in the commercial sector. Certain critical factors involved during the production process of copper wires are:

- Technical know-how and basic knowledge of the entrepreneur
- Use of quality raw materials
- Trained workforce
- Adopting new technology
- Strict quality assurance
- Up-to-date knowledge of technological innovations
- Rigorous supervision of the production process at every stage
- Attractive labeling and packaging and;
- Timely order processing and delivery

7. GEOGRAPHICAL POTENTIAL FOR INVESTMENT

For the success of this manufacturing unit, it is necessary to determine the target market of the product. In recent years, with rise in construction sector, the demand for Electric/Telephone/Other Copper-based cables has also increased all across the country. However, larger cities like Lahore, Karachi, Faisalabad, Peshawar, Quetta, Rawalpindi, Islamabad, Hyderabad, Faisalabad, Sialkot, Gujranwala, Bahawalpur, Mardan, Multan, Sukkur, Sahiwal, etc. carry greater potential for setting up this proposed unit.

Locating the unit in large developed cities would provide advantage of easy acquisition of quality raw material, easy availability of skilled workforce and proximity to market to generate consistent orders.

8. POTENTIAL TARGET CUSTOMERS / MARKETS

There is a large, growing demand for Electric/Telephone/Other Copper-based cables in the local market. Most of the copper-based wires are used for industrial and commercial applications.

Exports of the copper wire amounts to 0.015% of the total exports of Pakistan in 2020. There is an increase in the exports as compare to that of 2019 by 0.001%[7]. The global insulated wire and cable market size was valued at $160.54 billion in 2019, and is projected to reach $244.23 billion by 2027, to register a CAGR of 5.3% from 2020 to 2027.

As per United Nation's COMTRADE (International Trade Statistics) data, during 2019, Pakistan imported 1,270 metric tons of copper wire for USD 10.1 million. In 2020, the imports increased by 24% in quantity, reaching 1,574 metric tons for USD 11.1. This represented 11% increase in import value. The figures show an increasing trend in consumption of copper wires. Based on the above figures, it can be inferred that there is great potential in market, which can be tapped by investing in Electric/Telephone/Other Copper-based cables manufacturing business.

Copper wire is used in a wide variety of products, components and connections around the workplace. It has been long used and relied on to provide good results. Copper wire is preferred due to its better quality's conductivity, heat resistance, malleability (ability to be molded and shaped without breaking) and deductibility (ability to withstand high tensile stress).

Currently there are around 70 manufacturers of cable wire in Pakistan. Large manufacturers include Pakistan Cables, Fast Cables, Newage Cables, Green Cables and Pioneer Cables.

9. PROJECT COST SUMMARY

A detailed financial model has been developed to analyze the commercial viability of the "Electric/Telephone/Other Copper-based Cables Manufacturing Unit". Various costs and revenue related assumptions along with results of the analysis are outlined in this section.

The projected Income Statement, Cash Flow Statement and Balance Sheet are also attached as Annexure.

9.1 Project Economics

The financial feasibility analysis in Table 13 provides the information regarding projected IRR, NPV and payback period of the study.

[7] https://trendeconomy.com/data/h2/Pakistan/7408

Table 13: Financial Feasibility Analysis

Description	Values
IRR	83%
NPV (PKR)	85,876,714
Payback Period (years)	1.67
Projection Years	10
Discount rate used for NPV	15%

The financial feasibility analysis given is shown in Table 14. It 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	83%
NPV (PKR)	106,327,742
Payback Period (years)	1.67
Projection Years	10
Discount rate used for NPV	12%

9.2 Project Cost

Total investment cost of the project has been calculated to be PKR 13.51 million. The project will be financed through 100% Equity. Table 15 provides the detail of the project of the proposed manufacturing unit.

Table 15: Project Cost

Description of Costs	Amount (PKR)
Building Renovation Cost	654,600
Machinery & Equipment	6,920,000
Furniture & Fixtures	380,000
Office Equipment	1,056,500
Office Vehicles	1,242,300

Pre-operating Costs	451,497
Advance Rent / Security	405,000
Total Capital Cost	**11,109,897**
Working Capital	
Equipment spare part inventory	28,833
Raw material inventory	1,665,438
Prepaid building rent	135,000
Upfront insurance payment	103,800
Cash	500,000
Total Working Capital	**2,433,071**
Total Project Cost	**13,542,968**

9.2.1 Land

The proposed unit will be established in a rented building to avoid the high cost of land. Suitable location for setting up of a unit like this can be easily available on rent. Therefore, no land cost has been added to the project cost. Total space requirement for the proposed unit has been estimated at 1 Kanal (4,500 sq. ft.). This space requirement has been calculated on the basis of proposed manpower, required machinery and equipment, raw material etc. Rent of the building is PKR 135,000. Breakup of land is given in Table 16.

Table 16: Land Break Up

Description	Area Sq. Ft.
Office Area	432
Processing Hall	3,268
Store	320
Conference Room	200
Kitchen	120
Wash Room	160
Total	**4,500**

9.2.2 Building

There will be no cost of building construction, as the proposed business will be started in a rented facility covering area of 4,500 sq. ft. Industrial electricity connection having load

up to 50-60 KW is required for proposed project. There will be no cost of building construction; however, building renovation and interior decoration cost is included in the capital investment. Building rent is included in the operating cost. The detail of renovation cost is given in Table 17.

Table 17: Renovation Cost Details

Cost Item	Unit of Measurement	Total Liter / Area / Number	Cost/Unit/ sq. ft.	Total Cost
Paint Cost	Litre	442	500	221,000
Labor Cost	Feet	44,200	8	353,600
Curtains	Units	10	3,000	30,000
Blinds	Units	10	5,000	50,000
TOTAL (PKR)				**654,600**

9.2.3 Machinery and Equipment Requirement

Details of machinery and equipment required for the project are given in Table 18.

Table 18: Machinery and Equipment

Cost Item	Unit(s)	Unit Cost (PKR)	Total Cost (PKR)
Drawing Machine	1	500,000	500,000
Annealing Machine	1	1,000,000	1,000,000
Bunching Machine	1	1,200,000	1,200,000
Extruder	1	3,500,000	3,500,000
Printer	1	650,000	650,000
Testing Tools	1	20,000	20,000
Small Furnace	1	50,000	50,000
Total			**6,920,000**

Quality control involves testing units and determining if they are within the specifications for the final product. For this purpose, different tests are performed including conductivity of copper, cleanliness and smoothness of insulation. Quality checks are applied on both raw material and finished goods.

The product is also tested checked for embedded particles such as dust & other deleterious material. It shall also be free from slivers, cracks, spills and other harmful defects. Figure 11 shows different tools used in these tests.

Figure 11: Testing Tools

Functions of few Testings' Tools

Megger MIT520

The Megger is the instrument used for measuring the resistance of the insulation. It works on the principle of comparison i.e.; the resistance of the insulation is compared with the known value of resistance.

Micro Ohmmeter (LOM-510A)

An ohmmeter is an electrical instrument that measures electrical resistance (the opposition offered by a substance to the flow of electric current). Micro-ohmmeters (micro-meter or micro-ohmmeter) make low resistance measurements.

The LOM-510A Micro-Ohmmeter is a dedicated low resistance meter, useful wherever there is a need for measuring very low values of resistance.

Partial Discharge Detector

With the partial discharge measurement, the dielectric condition of high voltage equipment can be evaluated, and electrical treeing in the insulation can be detected and located. Partial discharge measurement can localize the damaged part of an insulated system.

High Voltage Discharge System

Partial discharges (PD) are small electrical sparks that occur within the insulation of medium and high voltage electrical assets. Data obtained through Partial Discharge Testing and Monitoring solutions can provide critical information on the quality of insulation and its impact on overall equipment health.

Direct Current (DC) High Voltage (HV) Test Set

High Voltage testing is usually performed to qualify the device to operate safely during rated electrical conditions, a way to check the effectiveness of its insulation. The objective sought during the high voltage testing will determine the type and amount of voltage applied and the acceptable current flow.

Universal Testing Machine

A universal testing machine (UTM), also known as a universal tester, materials testing machine or materials test frame, is used to test the tensile strength and compressive strength of materials. The machine has been named so because of the wide range of tests it can perform over different kind of materials.

Halogen Acid Gas Analyzer

The Halogen acid gas analyzer is used for the determination of the amount of halogen acid gas, other than hydrofluoric acid, evolved during the combustion of compounds based on the halogenated polymers and compounds containing halogenated additives taken from cable construction.

9.2.4 Furniture and Fixtures Requirement

Details of the furniture and fixture required for the project are given in Table 19.

Table 19: Furniture and Fixtures Requirement

Cost Item	Units	Unit Cost (PKR)	Total Cost (PKR)
Office Tables	6	25,000	150,000
Reception Counter	1	50,000	50,000
Executive Chairs	3	20,000	60,000
Office Chairs	5	10,000	50,000
Sofa Sets	2	35,000	70,000
Total			**380,000**

9.2.5 Office Equipment Requirement

Table 20 gives details of office equipment requirement proposed for the unit.

Table 20: Office Equipment Requirements

Cost Item	Units	Unit Cost (PKR)	Total Cost (PKR)
Air Conditioners	4	90,000	360,000
Laptop / Computer	4	80,000	320,000
Printer	3	40,000	120,000
LED 32”	1	40,000	40,000
Surveillance Cameras (2MP)	8	2,000	16,000
DVR	1	12,000	12,000
Water Dispenser	2	20,000	40,000
Ceiling Fan	7	4,500	31,500
Exhaust Fan	10	2,000	20,000
Bracket Fan	8	4,000	32,000
Wi-Fi / Internet Router	1	5,000	5,000
Freezer	1	60,000	60,000
Total			**1,056,500**

9.2.6 Vehicle Requirement

Details of vehicle required for the project is given in Table 21.

Table 21: Vehicle Details

Cost Item	Unit(s)	Unit Cost (PKR)	Total Cost (PKR)
Bolan	1	1,150,000	1,150,000
Motorcycle	1	80,000	80,000
Registration Charges		1%	12,300
Total Cost (PKR)			**1,242,300**

9.2.7 Pre-Operating Costs

Table 22 provides details of estimated pre-operating cost.

Table 22: Pre-Operating Cost Details

Pre-Operating Costs	Cost (PKR)
Administration Cost	230,000
Utilities expenses.	221,497
Total Cost (PKR)	**451,497**

9.2.8 Security against Building

Table 23 provides details of security against rented building.

Table 23: Security against Rented Building

Security against Building Rent	Frequency	No.	Unit Cost (PKR)	Cost (PKR)
Security against Building Rent	Months	3	135,000	405,000
Total Cost (PKR)				**405,000**

9.3 Break Even Analysis

Calculation of break-even analysis is given in Table 24.

Table 24: Break-Even Analysis

Description	Amount First Year (PKR)	Ratios
Sales (PKR) – A	45,080,000	100%
Variable Cost (PKR) – B	29,341,458	65%
Contribution (PKR) (A-B) = C	15,738,542	35%
Fixed Cost (PKR) – D	6,834,779	15%
Contribution Margin		35%
Breakeven Revenue	20,428,069	
Breakeven Production (90 meters rolls)	1,702	
Breakeven as % of Installed Capacity		22%

9.4 Revenue Generation

Based on 50% capacity utilization of the unit, sales revenue during the first year of operations is estimated as shown in Table 25.

Table 25: Revenue Generation

Product	Installed Capacity (90-meter Rolls)	Capacity Utilization @ 50% (90-meter Rolls)	Quantity Sold (90-meter Rolls) (A)	Sale Price / 90- meter Roll (B)	Total Revenue (A*B)
Cable/wire	7,840	3,920	3,757	12,000	45,080,000[8]

9.4.1 Variable Cost Estimate

Variable costs of the project have been provided in Table 26.

Table 26: Variable Cost Estimate

Description of Costs	Amount (PKR)
Material cost (Table 27)	19,985,251
Printing (Table 31)	234,000
Direct Labor	5,220,000
Direct Utilities cost	1,835,335
Machinery Maintenance – Cost	346,000
Indirect Utilities	162,672
Communications expense (phone, fax, mail, internet, etc.)	147,000
Office vehicles running expense	294,000
Office expenses (stationery, entertainment, janitorial services, etc.)	441,000
Promotional expense	225,400
Bad debt expense	450,800
Total Variable Cost	**29,341,458**

[8] Change in amount is due to rounding off

Material cost is given in Table 27.

Table 27: Material Cost

Material	Cost / 90 Meter Roll (PKR)
Copper (Table 27)	5,175
Polyvinyl Chloride (PVC) (Table 30)	145
Material Cost per meter	**5,320**
Quantity Sold (90-meter rolls)	3,757
Total Material Cost	**19,987,240**[9]

Table 28: Copper Standards

Length (m)	Diameter of Conductor (mm)	Approx. Specific weight of cable (Kg/100m)	Approx. weight of cable (Kg/m)
100	2.50	4.90	0.049

Raw material calculations are based on Copper Cable Circular PVC Insulated PVC 300/500 Volt as per BS 6004 1975 (British Standards).

Table 29: Copper Cost

Length (m)	Density of Copper (Kg/ cubic meter)	Diameter of Conductor (mm)	Weight of copper (Pi*D^2/4*L) (KG)	Copper Cost/ Kg (PKR)	Copper Cost/ 90-meter Roll (PKR)
1.00	8,940	2.50	0.0439	1,310	5,175

Table 30: Polyvinyl Chloride (PVC)

Approx. weight of Insulation (Kg/m)	Cost of PVC /KG (PKR)	Cost/ 90-meter roll (PKR)
0.005	316	145

[9] Difference due to rounding off

Table 31: Printing Cost

Monthly cost	Cost/ Ltr
Ink-(A)	4,500
Additive-(B)	15,000
Monthly Cost (C=A+B)	19,500
Yearly Cost (C*12)	**234,000**

One liter of ink is used for two months and cost per liter of ink is PKR 9000. Additive is used one liter per month.

9.4.2 Fixed Cost Estimate

Table 32 provides the highlight regarding estimated fixed cost of the project.

Table 32: Fixed Cost Estimate

Description of Costs	Amount (PKR)
Management Staff	2,940,000
Administration benefits expense	408,000
Building rental expense	1,620,000
Insurance expense	103,800
Professional fees (legal, audit, consultants, etc.)	167,400
Depreciation expense	1,505,280
Amortization of pre-operating costs	90,299
Total	**6,834,779**

9.5 Human Resource Requirement

Proposed manufacturing unit shall require the workforce at a salary cost as projected in Table 33.

Table 33: Human Resource Requirement

Post	No. of Employees	Monthly Salary (PKR)	Total Monthly Cost (PKR)	Annual Cost (PKR)
Owner/Operational Manager	1	70,000	70,000	840,000
Supervisor	1	50,000	50,000	600,000
Electrician cum operator	1	40,000	40,000	480,000
Mechanic cum operator	2	40,000	80,000	960,000
Labor-skilled	5	25,000	125,000	1,500,000
Labor-unskilled	5	20,000	100,000	1,200,000
Packing Staff	2	20,000	40,000	480,000
Procurement Officer	1	35,000	35,000	420,000
Marketing Officer	1	40,000	40,000	480,000
Admin & Finance Officer	1	40,000	40,000	480,000
Office Boy	1	20,000	20,000	240,000
Security	2	20,000	40,000	480,000
Total	**23**		**680,000**	**8,160,000**

10. CONTACT DETAILS

Contact details of suppliers of machinery and equipment are provided in Table 34.

Table 34: Contact Details of Suppliers

Cost Item	Contact Number	E-mail	Web Address
Drawing Machine	8613372130421 86051258526133	lilypeng@jc-brilliant.com	www.jc-brilliant.com
Annealing Machine	86075526890923		www.canroon.com
Bunching Machine	8676985886219 8613712903698		www.sinostarmachinery.en.made-in-china.com www.dgsinostar.com
Extruder	8651258810860 8615962391966	info@wanrooe.com	www.wanrooe.com
Printer	862786700672 8615377539929	whlabel@126.com	www.whlabel.com
Testing Tools	8651257758500 8613511635163	info@kscrown.com	www.kscrown.com
Small Furnace	8676985961080 8613600275376	gina@jinlaiem.com	www.inductionchina.com

11. USEFUL WEB LINKS

Table 35: Useful Web 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 Khyber Pakhtunkhwa	http://www.kp.gov.pk
Government of Sindh	www.sindh.gov.pk
Government of Balochistan	www.balochistan.gov.pk
Government of Gilgit Baltistan	https://gilgitbaltistan.gov.pk
Government of Azad Jammu & Kashmir	https://ajk.gov.pk
Trade Development Authority of Pakistan (TDAP)	www.tdap.gov.pk
Security and Exchange Commission of Pakistan (SECP)	www.secp.gov.pk
Federation of Pakistan Chambers of Commerce and Industry (FPCCI)	www.fpcci.com.pk
Technical Education and Vocational Training Authority (TEVTA)	www.tevta.org
Punjab Vocational Training Council (PVTC)	www.pvtc.gop.pk
Punjab Small Industries Corporation (PSIC)	www.psic.gop.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	**45,080,000**	**58,585,968**	**74,023,371**	**91,619,783**	**111,627,253**	**120,892,315**	**130,926,378**	**141,793,267**	**153,562,108**	**166,307,763**
Cost of sales										
Material cost	19,985,251	27,102,086	34,243,486	42,383,651	51,639,181	55,925,233	60,567,028	65,594,091	71,038,400	76,934,588
Direct Utilities cost	1,835,335	1,996,049	2,170,836	2,360,929	2,567,668	2,792,510	3,037,041	3,302,985	3,592,216	3,906,774
Direct Labor	5,220,000	5,602,800	6,013,672	6,454,675	6,928,017	7,436,072	7,981,384	8,566,685	9,194,909	9,869,202
Machinery Maintenance - Cost	346,000	374,718	405,820	439,503	475,981	515,488	558,273	604,610	654,793	709,140
Printing	234,000	253,422	274,456	297,236	321,906	348,625	377,561	408,898	442,837	479,592
Total cost of sales	27,620,586	35,329,075	43,108,270	51,935,994	61,932,755	67,017,928	72,521,286	78,477,269	84,923,155	91,899,297
Gross Profit	17,459,414	23,256,893	30,915,101	39,683,789	49,694,499	53,874,387	58,405,091	63,315,998	68,638,953	74,408,466
General administration & selling expenses										
Management Staff	2,940,000	3,155,600	3,387,011	3,635,391	3,901,987	4,188,133	4,495,262	4,824,915	5,178,742	5,558,516
Administration benefits expense	408,000	437,920	470,034	504,503	541,500	581,210	623,832	669,580	718,683	771,386
Building rental expense	1,620,000	1,782,000	1,960,200	2,156,220	2,371,842	2,609,026	2,869,929	3,156,922	3,472,614	3,819,875
Indirect Utilities	162,672	176,917	192,409	209,258	227,582	247,510	269,184	292,755	318,391	346,271
Communications expense (phone, fax, mail, internet, etc.)	147,000	157,780	169,351	181,770	195,099	209,407	224,763	241,246	258,937	277,926
Office vehicles running expense	294,000	315,560	338,701	363,539	390,199	418,813	449,526	482,491	517,874	555,852
Office expenses (stationery, entertainment, janitorial services, etc	441,000	473,340	508,052	545,309	585,298	628,220	674,289	723,737	776,811	833,777
Promotional expense	225,400	292,930	370,117	458,099	558,136	604,462	654,632	708,966	767,811	831,539
Insurance expense	103,800	88,230	72,660	57,090	41,520	25,950	10,380	177,895	151,211	124,526
Professional fees (legal, audit, consultants, etc.)	167,400	179,676	192,852	206,995	222,174	238,467	255,955	274,725	294,871	316,495
Depreciation expense	1,505,280	1,505,280	1,505,280	1,505,280	1,505,280	1,738,132	1,258,192	2,553,372	2,553,372	2,553,372
Amortization of pre-operating costs	90,299	90,299	90,299	90,299	90,299	-	-	-	-	-
Bad debt expense	450,800	585,860	740,234	916,198	1,116,273	1,208,923	1,309,264	1,417,933	1,535,621	1,663,078
Subtotal	8,555,652	9,241,392	9,997,199	10,829,951	11,747,189	12,698,252	13,095,208	15,524,537	16,544,938	17,652,614
Operating Income	8,903,762	14,015,501	20,917,902	28,853,839	37,947,310	41,176,135	45,309,883	47,791,461	52,094,016	56,755,852
Gain / (loss) on sale of machinery & equipment	-	-	-	-	-	-	1,730,000	-	-	
Gain / (loss) on sale of office equipment	-	-	-	-	422,600	-	-	-	-	
Gain / (loss) on sale of office vehicles	-	-	-	-	-	-	310,575	-	-	
Earnings Before Interest & Taxes	8,903,762	14,015,501	20,917,902	28,853,839	38,369,910	41,176,135	47,350,458	47,791,461	52,094,016	56,755,852
Earnings Before Tax	8,903,762	14,015,501	20,917,902	28,853,839	38,369,910	41,176,135	47,350,458	47,791,461	52,094,016	56,755,852
Tax	2,236,316	4,025,425	6,441,265	9,218,843	12,549,468	13,531,647	15,692,660	15,847,010	17,352,905	18,984,548
NET PROFIT/(LOSS) AFTER TAX	**6,667,446**	**9,990,076**	**14,476,637**	**19,634,996**	**25,820,442**	**27,644,488**	**31,657,799**	**31,944,450**	**34,741,111**	**37,771,305**

12.2 Balance Sheet

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	500,000	3,436,670	7,612,018	11,684,249	16,064,509	19,335,690	22,853,639	38,940,493	71,589,735	106,748,326	153,080,299
Accounts receivable		3,705,205	4,260,245	5,449,699	6,807,253	8,352,618	9,555,599	10,348,713	11,207,657	12,137,892	13,145,337
Raw material inventory	1,665,438	1,953,373	2,868,843	3,925,641	5,262,104	6,943,347	8,143,775	9,551,744	11,203,135	13,140,034	6,411,216
Equipment spare part inventory	28,833	33,725	39,446	46,137	53,964	63,118	73,826	86,350	100,998	118,131	-
Finished Goods inventory	-	1,200,895	1,536,047	1,874,273	2,258,087	2,692,728	2,913,823	3,153,099	3,412,055	3,692,311	3,995,622
Pre-paid building rent	135,000	148,500	163,350	179,685	197,654	217,419	239,161	263,077	289,384	318,323	-
Pre-paid insurance	103,800	88,230	72,660	57,090	41,520	25,950	10,380	177,895	151,211	124,526	-
Total Current Assets	2,433,071	10,566,599	16,552,609	23,216,773	30,685,090	37,630,870	43,790,202	62,521,371	97,954,175	136,279,544	176,632,473
Fixed assets											
Building/Infrastructure	654,600	589,140	523,680	458,220	392,760	327,300	261,840	196,380	130,920	65,460	-
Machinery & equipment	6,920,000	5,882,000	4,844,000	3,806,000	2,768,000	1,730,000	692,000	11,859,664	10,080,714	8,301,765	6,522,815
Furniture & fixtures	380,000	323,000	266,000	209,000	152,000	95,000	38,000	651,253	553,565	455,877	358,189
Office vehicles	1,242,300	1,055,955	869,610	683,265	496,920	310,575	124,230	2,522,821	2,144,398	1,765,975	1,387,551
Office equipment	1,056,500	898,025	739,550	581,075	422,600	1,816,470	1,425,143	1,086,642	853,790	620,938	388,086
Advance against Building Rent	405,000	405,000	405,000	405,000	405,000	405,000	405,000	405,000	405,000	405,000	405,000
Total Fixed Assets	10,658,400	9,153,120	7,647,840	6,142,560	4,637,280	4,684,345	2,946,213	16,721,760	14,168,387	11,615,015	9,061,642
Intangible assets											
Pre-operation costs	451,497	361,197	270,898	180,599	90,299	-	-	-	-	-	-
Total Intangible Assets	451,497	361,197	270,898	180,599	90,299	-	-	-	-	-	-
TOTAL ASSETS	**13,542,968**	**20,080,916**	**24,471,347**	**29,539,932**	**35,412,670**	**42,315,216**	**46,736,415**	**79,243,131**	**112,122,562**	**147,894,558**	**185,694,116**
Liabilities & Shareholders' Equity											
Current liabilities											
Accounts payable		3,204,226	4,266,480	5,427,696	6,767,570	8,310,961	9,140,560	9,989,477	10,924,458	11,955,343	11,983,596
Total Current Liabilities	-	3,204,226	4,266,480	5,427,696	6,767,570	8,310,961	9,140,560	9,989,477	10,924,458	11,955,343	11,983,596
Other liabilities											
Total Long Term Liabilities	-	-	-	-	-	-	-	-	-	-	-
Shareholders' equity											
Paid-up capital	13,542,968	13,542,968	13,542,968	13,542,968	13,542,968	13,542,968	13,542,968	13,542,968	13,542,968	13,542,968	13,542,968
Retained earnings		3,333,723	6,661,900	10,569,268	15,102,132	20,461,287	24,052,888	55,710,686	87,655,136	122,396,247	160,167,552
Total Equity	13,542,968	16,876,691	20,204,867	24,112,236	28,645,100	34,004,255	37,595,855	69,253,654	101,198,104	135,939,215	173,710,519
TOTAL CAPITAL AND LIABILITIES	13,542,968	**20,080,916**	**24,471,347**	**29,539,932**	**35,412,670**	**42,315,216**	**46,736,415**	**79,243,131**	**112,122,562**	**147,894,558**	**185,694,116**

12.3 Cash Flow Statement

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		6,667,446	9,990,076	14,476,637	19,634,996	25,820,442	27,644,488	31,657,799	31,944,450	34,741,111	37,771,305
Add: depreciation expense		1,505,280	1,505,280	1,505,280	1,505,280	1,505,280	1,738,132	1,258,192	2,553,372	2,553,372	2,553,372
amortization of pre-operating costs		90,299	90,299	90,299	90,299	90,299	-	-	-	-	-
Accounts receivable		(3,705,205)	(555,040)	(1,189,454)	(1,357,554)	(1,545,365)	(1,202,981)	(793,115)	(858,943)	(930,235)	(1,007,445)
Finished goods inventory		(1,200,895)	(335,152)	(338,226)	(383,814)	(434,642)	(221,094)	(239,276)	(258,956)	(280,256)	(303,311)
Raw Material Inventory	(1,665,438)	(287,936)	(915,470)	(1,056,797)	(1,336,463)	(1,681,243)	(1,200,428)	(1,407,969)	(1,651,391)	(1,936,899)	6,728,819
Equipment Spare parts Inventory	(28,833)	(4,891)	(5,721)	(6,692)	(7,827)	(9,154)	(10,707)	(12,524)	(14,648)	(17,133)	118,131
Pre-paid building rent	(135,000)	(13,500)	(14,850)	(16,335)	(17,969)	(19,765)	(21,742)	(23,916)	(26,308)	(28,938)	318,323
Advance insurance premium	(103,800)	15,570	15,570	15,570	15,570	15,570	15,570	(167,515)	26,684	26,684	124,526
Accounts payable		3,204,226	1,062,254	1,161,216	1,339,874	1,543,391	829,599	848,917	934,981	1,030,885	28,253
Cash provided by operations	(1,933,071)	6,270,394	10,837,248	14,641,499	19,482,393	25,284,813	27,570,836	31,120,593	32,649,241	35,158,591	46,331,973
Financing activities											
Issuance of shares	13,542,968	-	-	-	-	-	-	-	-	-	-
Cash provided by / (used for) financing activities	13,542,968	-	-	-	-	-	-	-	-	-	-
Investing activities											
Capital expenditure	(11,109,897)	-	-	-	-	(1,552,345)	-	(15,033,738)	-	-	-
Cash (used for) / provided by investing activities	(11,109,897)	-	-	-	-	(1,552,345)	-	(15,033,738)	-	-	-
NET CASH	500,000	6,270,394	10,837,248	14,641,499	19,482,393	23,732,468	27,570,836	16,086,855	32,649,241	35,158,591	46,331,973

13. KEY ASSUMPTIONS

13.1 Operating Cost Assumptions

Table 36: Operating Cost Assumptions

Description	Details
Building rent growth rate	10%
Furniture and fixture depreciation	15%
Vehicle depreciation	15%
Office equipment depreciation	15%
Inflation growth rate	8.3%
Wage growth rate	7.3%
Electricity price growth rate	8.8%
Office equipment price growth rate	8.0%
Office vehicle price growth rate	10.7%

13.2 Revenue Assumptions

Table 37: Revenue Assumptions

Description	Details
Sale price growth rate	8.3%
Initial year capacity utilization	50%
Capacity growth rate	10%
Maximum capacity utilization	90%

13.3 Financial Assumptions

Table 38: Financial Assumptions

Description	Details
Project life (Years)	10
Debt: Equity	0:100

13.4 Debt Related Assumptions

Table 39: Debt Related Assumptions

Description of Cost	Details
Project Life (Years)	10
Debt: Equity	50:50
Discount Rate	12%

13.5 Cash Flow Assumptions

Table 40: Cash Flow Assumptions

Description	Details
Accounts receivable cycle (in days)	30
Accounts payable cycle (in days)	45

14. TECHNICAL DATA

14.1 Insulation Parameters

Table 41 shows parameters of PVC insulation.

Source: http://www.pakistancables.com/media/20877/ct-2020-final.pdf?tab=productVerification

Symbols Used

°C (Degree Celsius), h (Hour), N/mm^2 (Newton Per Square Millimeter), mg/cm^2 (Milligram per Square Centimeter)

Table 41: Parameters of PVC Insulation

Parameters	Unit	Characteristics	
Maximum conductor temperature on normal operation	°C	70°C	90°C
Properties in the state as manufactured			
Minimum tensile strength	N/mm^2	12.5	12.5
Minimum elongation at break	%	125	150

Properties after aging in air oven			
Temperature	°C	80±2	100±2
Duration	h	168	168
Minimum tensile strength	N/mm^2	12.5	12.5
Maximum Variation	%	±20	±25
Minimum elongation at break	%	125	150
Maximum Variation	%	±20	±25
Bending at low temperature			
Temperature	°C	150±2	150±2
Requirement		no cracks	no cracks
Elongation at low temperature			
Temperature	°C	-15±2	-15±2
Minimum elongation without break	°C	30	20
Maximum conductor temperature on normal operation	°C	70°C	90°C
Impact at low temperature			
Temperature	°C	-	-15±2
Requirement	-	-	no cracks
Pressure at high temperature			
Temperature	°C	80±2	80±2
Maximum indentation	%	50	50
Resistance to cracking			
Temperature	°C	150±2	150±2
Requirement		no cracks	no cracks

Loss of mass			
Temperature	°C	80±2	80±2
Duration	h	168	168
Maximum loss of mass	mg/cm^2	2	1.5

Conductor Data is provided in Figure 12.

Source: http://www.pakistancables.com/media/20877/ct-2020-final.pdf?tab=productVerification

Figure 12: Conductors for Single and Multi-Core Cables

Nominal cross-sectional area mm²	Minimum number of wires in the conductor						Maximum resistance of conductor at 20°C	
	Circular Conductor		Circular Compacted Conductor		Shaped Conductor		Annealed Copper Conductor	Plain aluminium Conductor
	Cu	Al	Cu	Al	Cu	Al	Plain wires	
1.5	7	-	6	-	-	-	12.1	-
2.5	7	-	6	-	-	-	7.41	-
4	7	-	6	-	-	-	4.61	-
6	7	-	6	-	-	-	3.08	-
10	7	7	6	-	-	-	1.83	3.08
16	7	7	6	6	-	-	1.15	1.91
25	7	7	6	6	6	6	0.727	1.20
35	7	7	6	6	6	6	0.524	0.868
50	19	19	6	6	6	6	0.387	0.641
70	19	19	12	12	12	12	0.268	0.443
95	19	19	15	15	15	15	0.193	0.320
120	37	37	18	15	18	15	0.153	0.253
150	37	37	18	15	18	15	0.124	0.206
185	37	37	30	30	30	30	0.0991	0.164
240	37	37	34	30	34	30	0.0754	0.125
300	61	61	34	30	34	30	0.0601	0.100
400	61	61	53	53	53	53	0.0470	0.778
500	61	61	53	53	-	-	0.0366	0.0605
630	91	91	53	53	-	-	0.0283	0.0469
800	91	91	-	-	-	-	0.0221	0.0367
1000	91	91	-	-	-	-	0.0176	0.0291

Data regarding diameter of standard circular conductors is provided in Figure 13

Figure 13: Diameters of Stranded Circular Conductors

Cross-sectional Area	Stranded Compacted circular conductors (Class 2)	
mm²	Minimum diameter mm	Maximum diameter mm
10	3.6	4
16	4.6	5.2
25	5.6	6.5
35	6.6	7.5
50	7.7	8.6
70	9.3	10.2
950	11.0	12.0
120	12.3	13.5
150	13.7	15.0
185	15.3	16.8
240	17.6	19.2
300	19.7	21.6
400	22.3	24.6
500	25.3	27.6
630	28.7	32.5

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
3rd 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	5TH 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