



Pre-feasibility Study

MANUFACTURING UNIT FOR SEALANT

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, and revenues can change daily. For accurate financial calculations, utilize financial calculators on SMEDA’s website and consult financial experts to stay current with market conditions.”

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

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1. DISCLAIMER

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

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Document Control

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2. EXECUTIVE SUMMARY

This “Pre-feasibility Document” provides details for setting up a “Manufacturing Unit for Sealants” (hereinafter referred to as the proposed unit). Sealant is a substance used to block the passage of fluids through the surface or joints or openings in materials, a type of mechanical seal.¹ Sealants are widely used in automotive industry, construction industry, manufacturing industry, aerospace industry, cement and concrete manufacturing, architectural works and pipe threads and paint manufacturing. There are many different types of sealant products available in the market, each designed for a specific application i.e., silicone sealant, acrylic sealant, water-based latex, butyl sealant, polysulfide sealant, polyisobutylene sealant and polyurethane sealant.

The imports of adhesive and sealants in Pakistan were USD \$11.11 million in 2010 which increased to USD \$29.99 million in 2020, under the HS code 3506.²

This unit may be established in industrial areas of large to medium cities like Karachi, Lahore, Faisalabad, Islamabad, Peshawar, Mardan, Quetta Multan, Rawalpindi, Bahawalpur, Sargodha, Sukkur, Sheikhpura, Sialkot, Gujranwala, etc. These cities have been proposed due to presence of large industrial clusters and availability of good infrastructure and skilled labor.

The proposed manufacturing unit has a total capacity of manufacturing 67,200 liters of silicone sealant and 84,000 liters of acrylic sealant per year. The initial year production capacity of the proposed manufacturing unit is assumed to be 60% at which the proposed unit will manufacture 40,320 liter of silicone sealant and 50,400 liter of acrylic sealant. The proposed unit will achieve its maximum production capacity of 95% in 5th year of operations.

This manufacturing unit will be set up in a rented building with an area of 3,251 square feet (14 Marla). The proposed business requires a total investment of PKR 29.66 million. This includes capital investment of PKR 18.05 million and working capital of PKR 11.61 million. The project will be established using 100% equity financing. The Net Present Value (NPV) of project is PKR 108.98 million with an Internal Rate of Return (IRR) of 64% and a Payback period of 2.24 years. Further, this project is expected to generate Gross Annual Revenues of PKR 126.94 million during 1st year, Gross Profit (GP) ratio ranging from 35% to 39% and Net Profit (NP) ratio ranging from 9% to 16% during the projection period of ten years. The proposed project will achieve its estimated breakeven point at capacity of 40% (57,805 liters and 770,730 bottles) with annual breakeven revenue of PKR 80.88 million.

The proposed project may also be established using leveraged financing. At 50% financing at a cost of KIBOR+3%, the proposed business provides Net Present Value (NPV) of PKR 162.22 million, Internal Rate of Return (IRR) of 64% and Payback period of 2.24 years. Further, this project is expected to generate Net Profit

¹ Mechanical seal is a type of seal which is used at the entry or exit point of product to keep the fluid in or out.

² <https://comtrade.un.org/data/>

(NP) ratio ranging from 8% to 16% during the projection period of ten years. The proposed project will achieve its estimated breakeven point at capacity of 43% (61,442 liters and 819,231 bottles) with breakeven revenue of PKR 85.97 million.

The proposed project will provide employment opportunities to 37 people, working in one shift of 8 hours each during 280 days in a year. High return on investment and steady growth of business is expected to the entrepreneur having some prior experience or education in the related field of business. The legal business status of this project is proposed as "Private Company" or "Partnership" concern.

3. INTRODUCTION TO SMEDA

The Small and Medium Enterprises Development Authority (SMEDA) was established in October 1998 with the 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 facilitate potential investors in setting up a “Manufacturing Unit for Sealants” by providing a general understanding of the business with the intention of supporting them in 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

This document provides details for setting up a manufacturing unit for sealants. Sealant is a substance used to block the passage of fluids through the surface or joints or openings in materials; acting as a type of mechanical seal. Sealants also serve the purposes of blocking dust, sound and heat transmission. Sealants may be weak or strong, flexible or rigid, permanent or temporary. Sealants are not adhesives³ but some have adhesive qualities and are called adhesive-sealants or structural sealants.

In pre-historic times, mud, grass and reeds⁴ were used as sealants to seal dwellings from the impact of weather. Natural sealants and adhesive-sealants include plant resins such as pine pitch and birch pitch, wax, tar, natural gum, clay (mud) mortar, lime mortar, lead, and egg. In the 17th century, glazing putty was first used to seal window glass made with linseed oil and chalk. In the 1920s, polymers such as acrylic polymers, and silicone polymers were first developed and used in sealants. By the 1960s, synthetic-polymer-based sealants were widely available.

Sealant Properties

The importance of sealants is derived from a large variety of benefits offered by them. Typically, sealants are used to close small openings that are difficult to shut with other materials, such as concrete, drywall, etc. They seal top structures (such as buildings and machines). Sealants are particularly effective in waterproofing processes by keeping moisture out (or in) the components in which these are used. Sealants are commonly used in bathrooms, specifically around showers and bathtubs, because it is washable and stops mould and mildew growth. Sealants can

³ adhesive is any substance that is capable of holding materials together in a functional manner by surface attachment that resists separation.

⁴ a tall, slender-leaved plant of the grass family, which grows in water or on marshy ground.

provide thermal and acoustical insulation, and may also serve as fire barriers. Following properties have to be kept in view while selecting sealants for any particular application:

i. Consistency

Pourable sealants have a fluid consistency and are generally used in horizontal joints and can be self-leveling. Non-sag sealants⁵ are thicker and do not flow downwards, even on vertical joints.

ii. Durability

A sealant's expected life cycle under ideal conditions is unlikely to be the same as the actual lifespan. This is especially true if the sealant was either misapplied to the surface or is incompatible with it.

Silicones have the longest service life (around 20 years or more). Some acrylics and butyls last little more than 5 years.

iii. Hardness

A harder sealant is more resistant to damage. However, as hardness increases, the flexibility decreases.

iv. Exposure Resistance

High performance sealants continue to perform well and remain flexible in the sun, extremes temperature and moisture.

v. Movement Capability

Movement capability is shown as a percentage of the joint width e.g., a sealant with ± 10 percent movement capability in a 25 mm joint can stretch to 28 mm or contract to 23 mm and still recover without failing.

vi. Modulus

Modulus is an abbreviation of modulus of elasticity. Low-modulus sealants usually have high movement capability and vice versa. Low-modulus sealants are often used with delicate substrates. High-modulus sealants are often used in static and non-moving joints. Medium-modulus sealants are general purpose products and balance stress at the surface the sealant is adhering to and the stiffness of the sealant.

vii. Adhesion

How well a sealant will adhere to the construction material is an essential factor to consider. Test methods (ASTM⁶ C Series) evaluate the adhesion of elastomeric sealants. Manufacturers also provide adhesion data for various substrates.

⁵ Non-Sag Sealant is a single-component, UV stable sealant that provides exceptional durability, superior weather resistance, and excellent adhesion to a wide variety of substrates.

⁶ American Society for Testing Materials

viii. Non-Staining

The components within sealants can leach into porous substrates (such as natural stone) and may leave a visible stain. Sealants must be tested on an unnoticeable area before putting into use, even if the sealant claims to be non-staining.

ix. Ease of Application

A sealant curing and tooling (ease of getting a smooth surface of correct/required geometry) characteristics are important when it comes to judging a sealant's ease of application. Some sealants cure quickly while others may be designed to remain uncured.

x. Cost

Higher cost products generally come with a higher performance. Replacing failed sealants is, almost always more expensive than selecting the correct sealant in the first place.

Common Areas of Use

Uses of sealants vary widely and sealants are used in many industries. Sealants are more commonly used in automotive industry, construction industry, manufacturing industry, aerospace industry, cement and concrete manufacturing, architectural works and pipe threads and paint manufacturing.

Sealant Types

There are many different sealant products available, each designed for a different application, including structural applications e.g., for structural glazing,⁷ or bonding façade elements together. The most commonly used sealants are:

- Silicone Sealant
- Acrylic Sealant
- Water based Latex
- Butyl Sealant
- Polysulfide Sealant
- Polyisobutylene sealant
- Polyurethane

Silicone sealants have excellent thermal resistance, good dynamic movement capability and good adhesion and have good durability qualities.

Acrylic sealants are UV stable making them suitable for exterior applications to provide good protection against water and chloride intrusion.

⁷ structural glazing is term used to describe glass that is integral to the design of a building.

The proposed manufacturing unit will be manufacturing silicone sealant and acrylic sealant.

Silicone Sealant

Silicone sealant is a liquid form of sealant which has adhesive qualities. Typically, it looks, feels, and acts like a gel. It has a different chemical make-up from other organic polymer-based adhesives. Unlike adhesives, silicone sealant keeps its elasticity and stability at both high and low temperatures. Furthermore, silicone sealant is resistant to other chemicals, moisture, and weathering. This makes it less likely to fail when building and repairing objects.

Unlike adhesives, sealants must cure. Curing silicone basically means letting it dry. Curing silicone is not necessarily difficult, but it does require time. The temperature needs to be in the range 4-40°C and there needs to be between 5% and 95% humidity for silicone to cure. It can take as little as 24 hours to cure. However, it may take up to several days if the sealant is especially thick.

Silicone sealants are strong and are also easy to apply. Silicone's unique properties make it resistant to heat, moisture, and weathering so it can be applied to a variety of materials across a broad range of industries. These products are commonly used to bind surfaces such as plastic, metal, and glass together. For example, aquariums are often sealed with silicone. Windows are often sealed to frames with silicone adhesive since it is weather resistant.

Since silicone can keep its adhesive properties when temperatures are high, it is commonly used in automobiles, electronic devices and electrical appliances. Silicone adhesives are used as a bonding agent for parts in car engines, such as a car gasket. In appliances and electronic devices, silicone is used to seal cables and sensors into place. Silicone sealants can be used for filling cracks such as the ones in a window frame, or the joints of a pipe. Water-resistant silicone sealants are ideal for repairing areas around sinks and other areas where water is frequently found.

Chemical composition of silicone sealant includes: hydroxyl end blocked polydimethylsiloxane, nm-class active calcium carbonate, thermal silica, Methyl tributinoximo silane, long-chain liquid silicone, γ -aminopropyl triethoxysilane, organosilicon sealant mould inhibitor and Dibutyl tin laurate.

Acrylic Sealant

Acrylic sealant is also known with many other names like painter's caulk, acrylic adhesive sealant, acrylic caulk, water based concrete sealer, water-based sealant, acrylic latex caulk, decorators caulk. Acrylic sealants are highly resistant to degradation caused by environment;⁸ however, they are prone to chemical damage. Acrylic sealant is curable via many different ways however, if thermally cured; the

⁸ Environmental degradation is the deterioration of the environment through depletion of resources such as quality of air, water and soil.

curing time can be lowered significantly. Acrylic sealant has a high holding power and avoids any infiltration by foreign particles.

Acrylic sealant has good fluidity in a wide temperature range, strong adhesion, good elasticity and good weather resistance. It is non-toxic, harmless, non-flammable volatile and environmentally friendly. The water-based environmentally friendly formula system of acrylic water-based sealant ensures ultra-low VOC⁹ emissions, which can be used in a large number of indoor environments that require caulking and sealing but also require low VOC emissions. These sealants also offer fast cure, lower cost and good air permeability. Acrylic sealants are paintable having good adhesion and waterproofing properties.

Being resistant to moisture, low or high temperature, acrylic sealants can be applied to different materials both indoors and outdoors. Generally, it is used in construction, covering all kinds of cracks and gaps, expansion joints between prefabricated building elements, assembly of wood, PVC, iron and aluminum joinery, plastering of joinery, sealing of joints, aluminum roof and facade cladding plates.

Acrylic sealant is made by emulsifying acrylic or polyurethane resin through special emulsifying equipment. Acrylic sealants are processed from acrylic acid (hence acrylic sealant) via catalytic reaction. Chemical composition of acrylic sealant includes: nonionic surfactant (Triton X-405), ethylene glycol, titanium dioxide (76% Slurry), anionic thicker (Acrysol TT615), solid fume silica (Cab-O-Sil M5), zinc oxide premix, defoamer (Nopco NXZ).

5.1. Machinery and Equipment

Details of the machinery and equipment used in the proposed unit are as follows:

Automatic Sealant Mixer Machine

Automatic sealant mixer machine is an automatic machine used for manufacturing sealants. This machine has a capacity of mixing of 60 liter of materials per hour. It has an electric power of 6 kilowatts. Chemicals (according to the standard formula) are added into the machine tank and mixed for up to 2 hours for manufacturing of sealants. Proposed unit uses two mixer machines; one each for silicone and acrylic sealant. The material of the mixer machine is stainless steel. Mixer machine allows carrying out the mixing process in an effective and efficient way; so as to ensure that the end product meets the required quality standards. Figure 1 shows automatic sealant mixer machine.

⁹ Volatile organic compounds.

Figure 1: Automatic Sealant Mixer Machine**Sealant Filling, Sealing and Labeling Machine 300 ml**

Sealant filling and labeling machine is used to fill the liquid sealants in the cartridges of 300 ml. This machine has capacity of filling 20 cartridges per minute with an electric power of 1.5 kilowatts. The machine has a weight of 300 kg. This machine helps the manufacturer to fill the product in cartridges and put labels on them in an efficient and effective manner. Figure 2 shows sealant filling, sealing and labeling machine for 300 ml cartridges.

Figure 2: Sealant Filling, Sealing and Labeling Machine 300 ml

Plastic Tube Filling and Sealing Machine 50 ml

Plastic tube filling and sealing machine is used to fill the liquid sealants in the tubes of 50 ml and to seal these tubes. This machine has capacity of filling 15 tubes per minute and electric power of 1.5 kilowatts. This machine helps the manufacturer to fill and seal the product tubes in efficient and effective manner. Figure 3 shows plastic tube filling and sealing machine 50 ml.

Figure 3 : Plastic Tube Filling and Sealing Machine 50 ml

**Platform Trolley**

Platform trolley is used for carrying load or to transport the material from one point to another point within the factory. In the proposed project, trolley is used for internal movement of raw materials and finished products between different sections of the production unit. Figure 4 shows platform trolley.

Figure 4 : Platform Trolley



Carry Trolley with Tub (150 liter)

These carry trolleys with tubs are used for moving sealants from production department to filling and packing department. These are aging resistant and easy to clean. These tubs have a capacity of 150 liters and are made of linear low-density polyethylene (LLDPE) material. Figure 5 shows carry trolley with tub (150 liter).

Figure 5 : Carry Trolley with tub (150 liter)

**Electronic Measuring Cups 5 Liter**

Electronic Liquid measuring cups are usually made of plastic and are equipped with a handle which can tell the weight and volume. They are used to pour a liquid into the cup and bring it even with a measurement line without spilling. The proposed unit uses electronic measuring cups to measure the exact quantities being used for the manufacturing processes. Figure 6 shows electronic measuring cups.

Figure 6: Electronic Measuring Cups 5L

**Weight Balance (100 Kg)**

A weighing balance is used to measure the weight of a product. In the proposed project, total number of required material weight balances is four; two of which are used in the raw material store to measure the quantities of material supplied by the suppliers; whereas, the other two are used in the production department for measuring the quantity of raw materials to be used for production. Its electricity consumption is 10 watts. Figure 7 shows material weight balance.

Figure 7: Weight Balance (100 kg)**Generator (30 KW)**

Generator is required in the production unit to ensure uninterrupted supply of power. A 30 KW generator is recommended to provide constant supply of power in case of any interruption. Figure 8 shows electric generator.

Figure 8: Generator (30 KW)**Lab Equipment****Electronic Tensile Testing Machine**

Electronic tensile testing machine also known as a universal tester, materials testing machine or materials test frame, is used to test the tensile strength and compressive strength of the sealant products.

A typical tensile testing machine consists of a load cell, crosshead, extensometer, specimen grips, electronics and a drive system. It is controlled by testing software used to define machine and safety settings and store test parameters defined by

testing standards such as ASTM¹⁰ and ISO.¹¹ In the proposed project, this machine is used in quality control laboratory. Figure 9 shows electronic tensile testing machine.

Figure 9: Electronic Tensile Testing Machine



Laboratory Oven

Laboratory ovens, also referred to as laboratory furnaces, are used for variety of purposes; including drying, heating, testing environmental stresses, such as changes in temperature, light and humidity. In the proposed project, the oven is used in quality testing laboratory. Figure 10 shows laboratory oven.

Figure 10: Laboratory Oven



¹⁰ American Society for Testing and Materials.

¹¹ International Organization for Standardization.

Other Lab Consumable

Other lab consumables include petri dishes, glass beakers, magnetic mixers, test tubes, test tubes holders, test tube stands, conical flasks, and glass stirrers, burettes and graduated cylinders. Figure 11 shows petri dish and glass beaker.

Figure 11: petri Dish and Glass Beaker



Figure 12 shows magnetic mixer and test tubes.

Figure 12: Magnetic Mixer and test Tubes

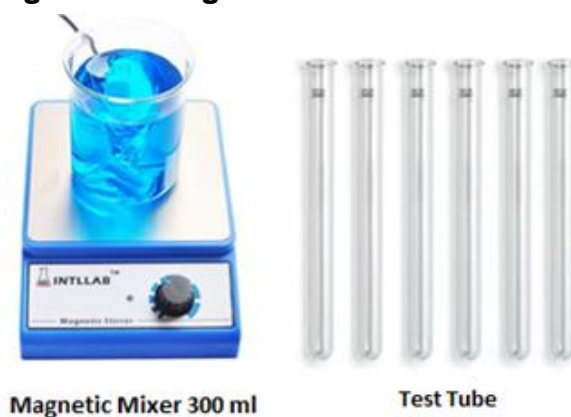


Figure 13 shows test tube stand and test tube holder.

Figure 13: Test Tube Stand and Test Tube Holder

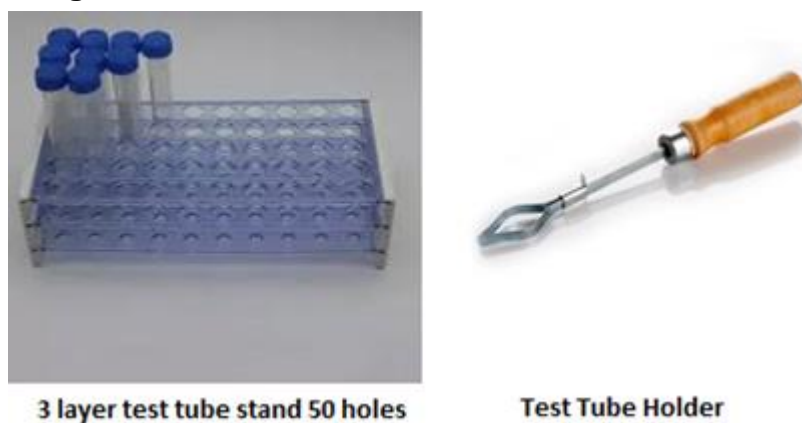


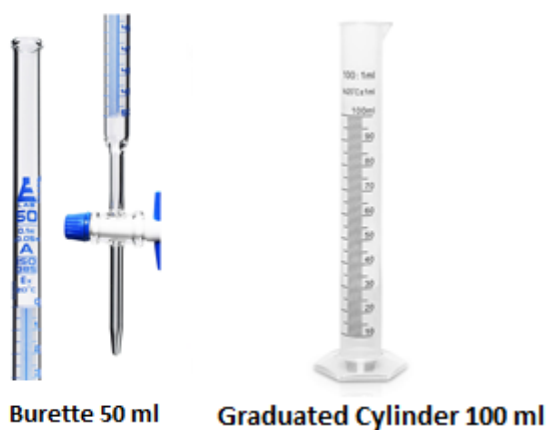
Figure 14 shows conical flask and glass stirrer.

Figure 14: Conical Flask and Glass Stirrer



Figure 15 shows burette and graduated cylinder.

Figure 15: Burette and Graduated Cylinder

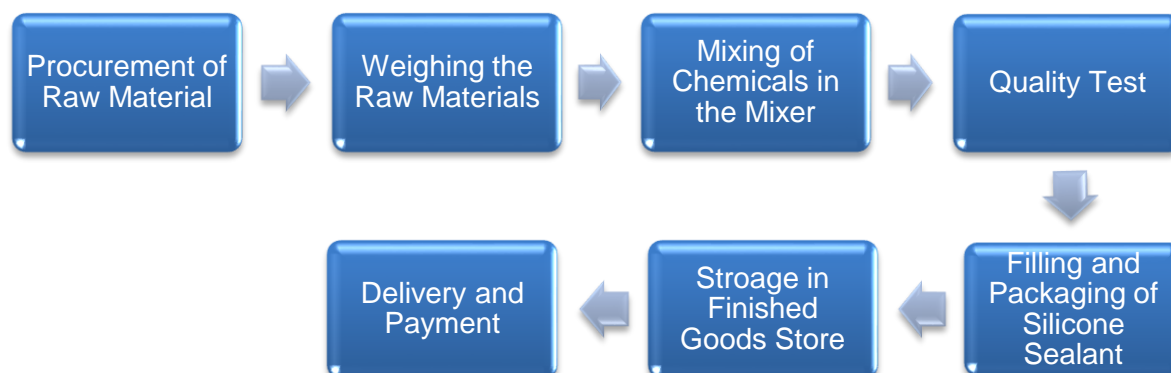


5.2. Process Flow for Manufacturing of Sealants

Silicone Sealant

The process of manufacturing silicone sealant is shown in Figure 16.

Figure 16 : Process Flow for Manufacturing of Silicone Sealant



Procurement of Raw Material (Chemicals)

The process for manufacturing silicone sealant starts by procurement of the required chemicals. The chemicals, required for manufacturing of silicone sealant are:

- Hydroxyl end blocked polydimethylsiloxane
- nm-class active calcium carbonate
- Thermal silica
- Methyl tributanoxy silane
- Long-chain liquid silicone
- γ -aminopropyl triethoxysilane
- Organosilicon sealant mould inhibitor
- Dibutyl tin laurate.

The proposed manufacturing unit will maintain raw material inventory equivalent to two months of silicone sealant production due to unavailability of these chemicals in the local market. These chemicals will be imported from other countries.

Hydroxyl end blocked polydimethylsiloxane

Polydimethylsiloxane hydroxy also known as PDMS or dimethicone, is used as a silicon-based organic polymer. Polydimethylsiloxane (PDMS) is the simplest member of the silicone polymer family. At higher molecular weights, PDMS is a soft, compliant rubber or resin.

nm-class active calcium carbonate

The nano calcium carbonate can significantly shorten surface drying time, reduce the curing silicone sealant modulus, and improve the filling silicone sealant thixotropy, processing and adhesion properties.

Thermal silica

The thermal conductive silica gel sheet is a polymer composite heat conductive material which is made of a silicone resin as a bonding base material and is filled with a heat conductive powder to achieve heat conduction. Thermal silica is an important ingredient to manufacture a wide variety of materials.

Methyl Tributanoximo Silane

Methyl tributanoximo silane is mainly a silica gel solidifying agent and phthalic resin coating anti. It is used as crosslinking agent for preparing room curing silicone sealant.

Long-chain liquid silicone

Liquid silicone, one kind of silicon polymer, is a highly valuable material versatile for making a wide spectrum of products in various industries and applications due to its flexibility, stability, translucency, thermal conductivity, non-conductive electricity as well as fast-curing capacity.

γ -aminopropyl triethoxysilane

γ -Aminopropyl triethoxysilane acts as a coupling agent. It is intended to improve bonding or adhesion between organic polymers and mineral surfaces, such as pigments, fillers, and glass or metal surfaces.

Organosilicon sealant mould inhibitor

Organosilicon sealant mould inhibitors are feed additives used to minimize mould contamination and prevent mould growth.

Dibutyl tin Laurate.

Together with dibutyltin di-octanoate, dibutyltin dilaurate is used as a catalyst for sealants production from isocyanates and diols. It is also useful as a catalyst for transesterification and for the room temperature vulcanization of silicones. It is also used as a stabilizer in polyvinyl chloride.

Weighing of Raw Materials

Before starting the production process all the raw materials are measured in the required quantities using electronic measuring cups. Quantities of different ingredients are shown in Table 1.

Table 1: Composition of Silicone Sealant per Batch

Raw material / Input name	Consumption per Batch (Liter)
vHydroxyl Endblocked Polydimethylsiloxane	28.73

Nm-Class Active Calcium Carbonate	20.11
Thermal Silica	1.15
Methyl Tributanoxy Silane	2.40
long-chain liquid silicone	6.23
γ -Aminopropyl Triethoxysilane	0.71
Organosilicon Sealant Mould Inhibitor	0.38
Dibutyl Tin Laurate	0.29
Total	60.0

Mixing of Chemicals in the Mixer

In this process, the above-mentioned chemicals are mixed in the mixing machine for 2 hours in the required ratio. Mixing is carried out in batches with a standard batch size of 60 liters.

Quality Testing

After mixing of chemicals in the mixer machine, silicone sealant is transferred into carry trolleys with tub from the mixer machine and then transferred to the quality control department, manually.

Quality Test

The quality of the manufactured silicone sealant is tested by the Quality Controller (QC) as per the ASTM C series standards of the product. Tensile testing machine is used to check the tensile strength of the product. Displacement force per inch, strain force and load is matched with the ASTM standard. QC uses the laboratory oven to test the product for environmental testing and for temperature test. Another test performed on the product is stain test, QC applies the product on a surface to test if the product leaves any stain. When all the tests are clear the batch is approved and sent to packing department.

Filling and Packaging of Silicone sealant

Filling machines are used to fill the manufactured silicone sealant in small tubes of 50 ml and plastic cartridges of 300 ml. Manufacturing unit uses two types of machines for two types of packings. After filling, the finished products are packed in carton boxes and are sent to finished goods store.

Figure 17 shows finished product-silicone sealant 300 ml cartridge and Figure 18 shows finished product-silicone sealant 50 ml tube.

Figure 17: Finished Product-Silicone Sealant 300 ml Cartridge**Figure 18 : Finished Product-Silicone Sealant 50 ml tube**

Finished Goods Store

After completion of the manufacturing process, the cartons of silicone sealant products are transferred to finished goods store through trolleys. These are stored by store keeper with the intention to avoid any damage or loss. The finished goods store maintains an inventory of silicone sealant, equal to half month production.

Acrylic Sealant

The manufacturing process of acrylic sealant is discussed in Figure 19.

Figure 19 : Process Flow for Manufacturing of Acrylic Sealant

Procurement of Raw Material (Chemicals)

The manufacturing process for acrylic sealant will start from procurement of the required chemicals.

Chemicals required for manufacturing acrylic sealant includes: nonionic surfactant (Triton X-405), ethylene glycol, titanium dioxide (76% Slurry), anionic thicker (Acrysol TT615), solid fume silica (Cab-O-Sil M5), zinc oxide premix and defoamer (Nopco NXZ).

Anionic Surfactant (Triton X-405)

Triton X-405 is a high-quality product used as multipurpose non-ionic surfactant, very often used to optimize protein-protein interactions.

Ethylene Glycol

Anti-freezing agent, such as ethylene glycol and propylene glycol, is used to lower the freezing point of the tire sealant in order to prevent the sealant from freezing at low temperature operating environment.

Titanium Dioxide (TIPURE R942)

Titanium dioxide provides durability and hiding power¹² of products. It aids in preserving the color quality for decorative coatings, it provides resilience and ultraviolet (UV) protection.

Anionic Thickener (ACRYSOL TT615)

It is an alkali swellable acrylic polymer emulsion used as either a primary or ancillary thickener. This product exhibits efficient viscosity builds at low shear levels.

Solid Fume Silica (Cab-O-SIL M5)

CAB-O-SIL M-5 is an untreated medium surface fumed silica that provides thickening, thixotropic¹³, and anti-settling behavior in liquid systems. It is most efficient in non-polar to medium polarity systems, increases hardness, tensile strength and elongation.

Zinc Oxide Premix

Zinc oxide premix is made by admixing 311-gram ammonium bicarbonate, 322 gram zinc oxide (KADOX 515), 1210 gram ammonium hydroxide (28%) with 716 gram deionized water.

Defoamer (NOPCO NXZ)

NOPCO NXZ is metallic soap type anti-foaming agent for latex and emulsions, especially for acrylic, vinyl acetate or vinyl acetate-acrylic emulsions.

Weighing of Raw Materials

¹² Hiding power is the ability to hide the surface of an object.

¹³ A thixotropic fluid is one that takes a fixed time to return to its equilibrium viscosity when subjected to abrupt changes in shear rate

Before starting the production process, all the raw materials are measured in the required quantities using electronic measuring cups. Quantities of different ingredients are shown in Table 2.

Table 2: Composition of Acrylic Sealant per Batch

Raw material / Input name	Consumption per Batch(Liter)
Nonionic Surfactant (Triton X-405)	1.28
Ethylene Glycol	0.82
(Titanium Dioxide 76% slurry) (TIPURE R942)	19.33
Anionic thickener (Acrysol TT615)	4.81
Solid Fume Silica (Cab-O-Sil M5)	6.42
Zinc Oxide Premix (Ammonia 28%)	26.06
Defoamer (Nopco NXZ)	1.28
Total	60.0

Mixing of chemicals in the Mixer

In this process, the above-mentioned chemicals are mixed in the mixing machine for 1.5 hours in the required ratio. Mixing is carried out in batches with a standard batch size of 60 liters.

Quality Testing

After mixing of chemicals in the mixer machine, acrylic sealant is transferred into carry trolleys with tub from the mixer machine and then transferred to the quality control department.

Quality Test

After the mixing process, the manufactured product is sent to quality test department for final check. Quality Controller (QC) performs the test according to ASTM C series standard on the product. Tensile testing machine is used to check the tensile strength of the product. Displacement force per inch, strain force and load is matched with the ASTM standards. QC uses the laboratory oven to test the product for environmental testing and for temperature test. Another test that is performed on the product is stain test. Quality controller applies the product on a surface to test if the product leaves any stain. When all the tests are clear, the product is sent to packing department.

Filling and Packaging of Acrylic Sealant

In the last step, filling machine is used to fill the manufactured acrylic sealant in small tubes of 50 ml and plastic cartridges of 300 ml. Manufacturing unit uses 2 different types of machines for these 2 different types of packings, which include small tubes

and plastic cartridges. After filling, the finished product is packed in carton boxes and sent to finished goods store. Figure 20 shows finished product-acrylic sealant 300 ml cartridge and Figure 21 shows finished product-acrylic sealant 50 ml tube.

Figure 20 : Finished Product-Acrylic Sealant 300 ml Cartridge



Figure 21 : Finished Product-Acrylic Sealant 50 ml Tube



Finished Goods Store Room

After completion of manufacturing process, the cartons of acrylic sealant products are then transferred to finished goods store through the use of trolleys. These are stored by the store keeper in safe and secure conditions. The finished goods store room maintain finished inventory of acrylic sealant, equal to half month production.

Delivery and Payment

Finished products (sealants) are delivered to the target market through carry van. Usually, the payment is made in cash but for reliable customers, credit facility of 20 days is provided.

5.3. Installed and Operational Capacities

The proposed manufacturing unit of sealant will operate in a single shift of 8 hours in a day for 280 days in a year. Further, it is assumed that the operational capacity for the manufacturing unit of sealant is 60% during the first year of its operations. The capacity will increase at the rate of 10% per annum attaining a capacity of maximum of 95% of its total production capacity during the projected period of 10 years. The manufacturing unit at maximum capacity will manufacture 67,200 liter of silicone sealant and 84,000 liters of acrylic sealant. In terms of 50 ml tubes and 300 ml cartridges, at 100% capacity, the manufacturing unit will manufacture 806,400 50-ml tubes of silicone sealant, 89,600 300-ml cartridge of silicone sealant, 1,008,000 50-ml tubes of acrylic sealant and 112,000 300-ml cartridge of acrylic sealant.

However, during first year of production the manufacturing unit will manufacture 40,320 liter of silicone sealant and 50,400 liters of acrylic sealant. In terms of 50 ml tubes and 300 ml cartridges at, 60% capacity the manufacturing unit will manufacture 483,840 50-ml tubes of silicone sealant, 53,760 300-ml cartridge of silicone sealant, 604,800 50-ml tubes of acrylic sealant and 67,200 300-ml cartridge of acrylic sealant. Production capacity of the unit will be based on the mixing machine.

Table 3 shows details of maximum annual capacity and operational capacity utilized during first year of operations for silicone sealant in liters and Table 4 shows maximum annual capacity and operational capacity utilized during first year of operations for silicone sealant packing wise.

Table 3: Installed and Operational Capacity of Silicone Sealant (Liters)

Product	Average Time per Batch (Hours)	No. of Batches Per Day	Production Capacity of Machine (Liter/2 hour)	Per Day Capacity (Liters)	Annual Production (liters) @100% Capacity	Initial Year Production (liters) @60% Capacity
Silicon Sealant	2	4	60	240	67,200	40,320
Total					67,200	40,320

Table 4: Packing Wise Installed and Operational Capacity of Silicone Sealant

Product	Product Size (ml) A	Initial Year Production (liter) B	Production Ratio C	Annual Production (Tubes/Cartridges) @100% Capacity (B*1000*C)/A	Initial Year Production (Tubes/Cartridges) @ 60% Capacity
Silicon Sealant-50 ml	50	40,320	60%	806,400	483,840
Silicon Sealant-300 ml	300		40%	89,600	53,760

Table 5 shows details of maximum annual capacity and operational capacity utilized during first year of operations for acrylic sealant.in liters and Table 6 shows details of maximum annual capacity and operational capacity utilized during first year of operations for acrylic sealant packing wise.

Table 5: Installed and Operational Capacity of Acrylic Sealant (liters)

Product	Average Time per Batch (Hours)	No. of Batches Per Day	Production Capacity of Machine (Liter/1.5 hour)	Per Day Capacity (Liters)	Annual Production (liters) @100% Capacity	Initial Year Production (liters) @60% Capacity
Acrylic Sealant	1.5	5	60	300	84,000	50,400
Total					84,000	50,400

Table 6: Packing Wise Installed and Operational Capacity of Acrylic Sealant

Product	Product Size (ml) A	Initial Year Production (liter) B	Production Ratio C	Annual Production (Tubes/Cartridges) @100% Capacity (B*1000*C)/A	Initial Year Production (Tubes/Cartridges) @ 60% Capacity
Acrylic Sealant-50 ml	50	50,400	60%	1,008,000	604,800
Acrylic Sealant-300 ml	300		40	112,000	67,200

6. CRITICAL FACTORS

Before making the decision to invest in manufacturing unit for sealants, one should carefully analyze the associated risk factors. The important considerations in this regard include:

- Availability of skilled staff
- Availability of good quality raw materials
- Maintaining high quality of finished products
- Use of modern technology and machines for maintaining quality and boosting appearances
- Continuous inspection of production processes
- Strict quality control measures
- Strong distribution channels

7. GEOGRAPHICAL POTENTIAL FOR INVESTMENT

Major users of sealants are in automotive industry, construction industry, manufacturing industry, aerospace industry, cement and concrete manufacturing, architectural works and pipe threads. Therefore, the proposed manufacturing unit should be established in large to medium cities of Pakistan, including Karachi, Lahore, Faisalabad, Islamabad, Peshawar and Quetta Gujranwala, Sheikhpura, Sukkur, Rawalpindi, Multan, Bahawalpur, Sargodha, Sialkot, etc. These cities have large industrial clusters which are the potential customers of the proposed manufacturing unit. Construction activity is also high in such cities. Moreover, these cities also offer the benefits of easy access to low-cost labor, and presence of good infrastructure.

8. POTENTIAL TARGET MARKETS/CUSTOMERS

The potential target markets/customers for sealants are construction companies, manufacturing units, automobile manufacturers, architectural work industry, paint manufacturing industry and general households.

The global market size for adhesives and sealants is projected to grow from USD 63.2 billion in 2020 to USD 80.0 billion by 2025, at a CAGR of 4.8%. The major drivers for the market are increased demand for adhesives and sealants from the building and construction industry, and growth in the appliances industry.¹⁴

The country's construction industry accounts for 2.53% of Gross Domestic Product (GDP) according to the Economic Survey of Pakistan 2020-2021,¹⁵ manufacturing

¹⁴ <https://www.marketsandmarkets.com/Market-Reports/adhesive-sealants-market-421.html>

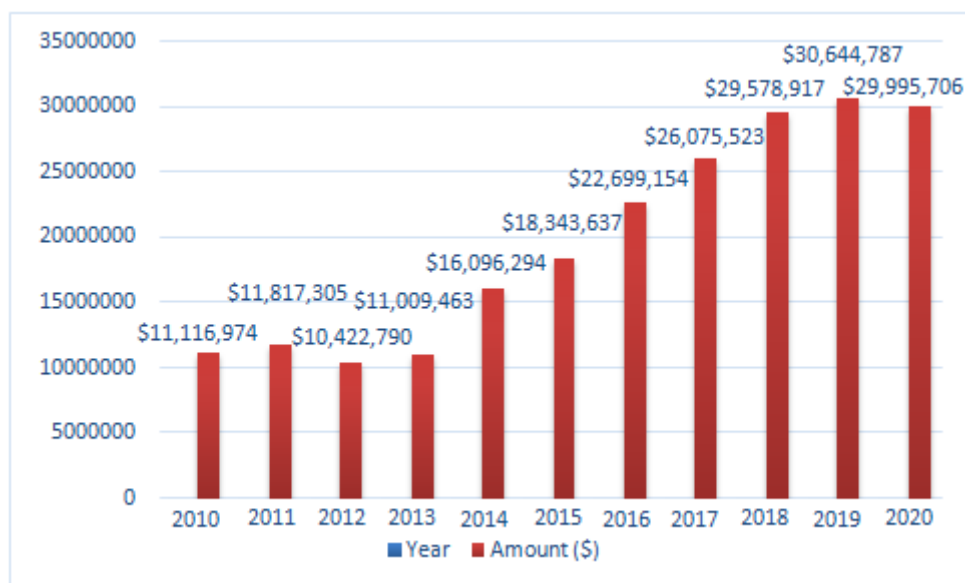
¹⁵ <https://invest.gov.pk/housing-and-construction>

sector grew by 9.9% in August of 2021 over the same month during the previous year,¹⁶ and automobile sector recorded a growth of 23.38%.¹⁷ The growth in aforementioned industries is expected to directly generate demand for the products manufactured by the proposed manufacturing unit.

The Pakistan paints and coatings market is expected to grow at a CAGR of over 3% during the forecast period (2021-26).¹⁸ The paint and coatings industry in Pakistan has registered a steady growth on the back of strong economic performance of the domestic economy in the last few years. With GDP growth at 3.94% for FY2021,¹⁹ driven by a healthy growth in the construction manufacturing and service sectors.

Figure 22 shows the adhesive and sealant import trends of Pakistan.

Figure 22 : Adhesive and Sealant Market Import Trends in Pakistan



The imports of adhesive and sealants in Pakistan was USD \$11.11 million in 2010 which increased to USD \$29.99 million in 2020 under the HS code 3506²⁰. Continued growth in the automotive manufacturing, furniture manufacturing and construction industry is expected to cause a surge in demand of adhesive and sealants in Pakistan.

Currently sealants are manufactured only by large scale businesses in Pakistan. Harris Silicones, Sika Pakistan and GMSA are among the largest sealant manufacturers in Pakistan.

¹⁶ https://www.finance.gov.pk/survey/chapters_18/03-Manufacturing.pdf

¹⁷ https://www.finance.gov.pk/survey/chapters_21/01-Growth.pdf

¹⁸ <https://www.google.com/search?q=grwoth+of+paint+sector+in+pakisyan&oq=grwoth+of+paint+sector+in+pakisyan&aqs=chrome..69i57.9280j0j7&sourceid=chrome&ie=UTF-8>

¹⁹ https://www.finance.gov.pk/survey/chapters_21/01-Growth.pdf

²⁰ <https://comtrade.un.org/data/>

9. PROJECT COST SUMMARY

A detailed financial model has been developed to analyze the commercial viability of manufacturing unit for sealants. Various assumptions relevant to revenue and costs along with the results of the analysis are outlined in this section.

The projected Income Statement, Cash Flow Statement and Balance Sheet are attached as annexures of this document.

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

9.1. Initial Project Cost

Table 7 provides fixed and working capital requirements for establishment of manufacturing unit for sealants.

Table 7: Initial Project Cost estimates

Particulars	Cost (PKR)	Reference
Land	-	9.1.1
Building / Infrastructure	509,265	9.1.2
Machinery & equipment	7,982,000	9.1.3
Furniture & fixtures	1,460,000	9.1.5
Office vehicles	1,293,500	9.1.6
Office equipment	1,652,000	9.1.4
Pre-operating costs	4,492,732	9.1.7
Security Against Building	585,180	9.2.9
Legal & licensing fee	79,000	9.1.8
Total Capital Cost - (A)	18,053,677	
Consumables inventory	38,967	
Raw material inventory	9,376,721	
Upfront building rent	195,060	
Cash	2,000,000	
Total	11,610,747	
Total Project Cost - (A+B)	29,664,424	

9.1.1. Land

The proposed unit will be established on a rented land having an area of 3,251 square feet (14 Marla). Total rental cost has been estimated as PKR 195,060. The breakup of the space requirement is provided in Table 8.

Table 8: Breakup of Space Requirement

Production Area	Number	Length	Width	Area (Sq. Ft.)
Raw Material Store Room	1	20	20	400
Production & Packing Department	1	30	30	900
Finished Goods Store Room	1	24	24	576
Washrooms	3	6	8	108
Office Block				
Executive Office	1	15	12	180
Accounts department	1	12	10	120
Procurement department	1	12	10	120
HR and Admin department	1	15	10	150
Sales and Marketing department	1	15	15	120
Quality Control Lab	1	12	15	225
Kitchen	1	10	10	100
Washrooms	3	8	8	192
Total Area		179	170	3,251

9.1.2. Building/ Infrastructure

There will be no cost of building construction since the manufacturing unit for sealants will be started in a rented building having an area of 3,251 square feet. However, there will be a renovation cost required to make the building usable for the business. Building rent of PKR 195,060 per month has been included in the operating cost as well as it is also included in the capital investment. The proposed project requires electricity load of around 18-19 KW for which an industrial electricity connection will be required. Table 9 provide details of building renovation cost.

Table 9: Building Renovation Cost

Cost Item	Unit of Measurement	Total Units	Cost/Unit (PKR)	Total Cost (PKR)
Paint Cost	Liter	31	500	15,705
Labour Cost-Paint	Square Feet	3,141	10	31,410
Glass partition	Square Feet	693	550	381,150
Shelves-Precasted	Square Feet	180	300	54,000
Blinds	Units	7	3000	21,000
Curtains	Units	2	3,000	6,000
Total (PKR)				509,265

9.1.3. Machinery and Equipment

Table 10 provides details of machinery and equipment for the proposed project.

Table 10: Machinery Cost Details

Cost Item	Number of Items	Unit Cost (PKR)	Total Cost (PKR)
Automatic Sealant Mixer Machine-Silicon Sealant (60 liter) -6Kw	1	1,950,000	1,950,000
Automatic Sealant Mixer Machine-Acrylic Sealant (60 liter) -6Kw	1	1,950,000	1,950,000
Sealant Filling and sealing Machine (300ml)(20 BPM)-	1	1,600,000	1,600,000
Sealant plastic tube filling and sealing machine(50ml) (1.5kW)-15 BPM	1	750,000	750,000
Platform Trolley	4	20,000	80,000
Carry Trolley with tub (150 liter)	4	30,000	120,000
Generator (30 KW)	1	1,000,000	1,000,000
Electronic Weigh Balance (100Kg)	2	10,000	20,000
Fire Handling and Safety Equipment			
Fire Extinguisher (2 kg)	6	2,000	12,000
Fire Alarm System	1	150,000	150,000
Lab Equipment			
Electronic tensile testing machine	1	200,000	200,000

Labortary Oven	1	150,000	150,000
Total (PKR)			7,982,000

9.1.4. Office Equipment

Table 11 shows details of equipment cost required for the manufacturing unit for sealants.

Table 11: Office Equipment Cost Details

Cost Item	No.	Unit Cost (PKR)	Total Cost (PKR)
Laptops	6	80,000	480,000
Desktop Computers	8	25,000	200,000
Printers	2	40,000	80,000
CCTV Cameras (2 MP)	16	2,000	32,000
DVR	2	12,000	24,000
LED TV	1	15,000	15,000
Air Conditioners	8	80,000	640,000
Exhaust Fan	13	3,000	39,000
Ceilling Fan	16	4,500	72,000
Bracket Fan	4	5,000	20,000
Water Dispenser	2	20,000	40,000
Wi-Fi / Internet Router	2	5,000	10,000
Total Cost (PKR)			1,652,000

9.1.5. Furniture and Fixture

Table 12 provides details of furniture and fixtures.

Table 12: Furniture & Fixtures Cost Details

Cost Item	Number of Items	Unit Cost (PKR)	Total Cost (PKR)
Executive Table	1	35,000	35,000
Executive Chairs	1	20,000	20,000
Office Table	19	25,000	475,000
Office Chairs	57	10,000	570,000
Sofa Set	2	35,000	70,000
Office/Lab Racks	25	8,000	200,000

Cabinets	9	10,000	90,000
Total Cost (PKR)			1,460,000

9.1.6. Vehicles

Table 13 provides details of the vehicles required along with their cost for the proposed project.

Table 13: Office Vehicle Cost Details

Cost Item	Number of Vehicles	Unit Cost (PKR)	Total (PKR)
Motorcycle	1	80,000	80,000
Carry Van	1	1,200,000	1,200,000
Registration Charges-Motorcycle	1	1,500	1,500
Registration Charges-Carry Van	1	1%	12,000
Total Cost (PKR)			1,293,500

9.1.7. Pre-Operating Costs

Table 14 provides details of estimated pre-operating costs.

Table 14: Pre-Operating Cost Details

Costs Item	No.	Hiring Months Beforein Year 0	Unit Cost (per month) (PKR)	Cost (PKR)
Manager Production	1	1	100,000	100,000
Labour Skilled-Mixing	2	1	35,000	70,000
Store Keeper	1	1	40,000	40,000
Wholesale Sale Manager	1	1	80,000	80,000
Quality Control officer	1	1	70,000	70,000
Security Guard	1	1	22,000	22,000
Office Boy	1	1	22,000	22,000
Utilities Expenses				88,732
Brand launching Cost				4,000,000
Total Cost (PKR)				4,492,732

9.1.8. Licenses and Permits

The legal status of a “Manufacturing Unit for Sealants” is Private Company or Partnership concern. The details of legal and licensing fee are provided in the Table 15.

Table 15: Licenses, Permits Cost Details

Particular	Cost (PKR)
<u>Trade Mark Registration</u>	
Professional charges for registration	30,000
Trade Mark search fee	500
Trade Mark application fee	1,000
Trade Mark Certificate fee	3,000
Miscellaneous Expenses	1,500
Total	36,000
Company Registration Charges -SECP	
Professional charges for registration	40,000
Company Incorporation fee	3,000
Total	79,000

9.1.9. Security against Building**Table 16: Security against Building**

Particular	Months	Rent per month (PKR)	Total (PKR)
Security against building	3	195,060	585,180
Total (PKR)			585,180

9.1.10. Initial Working Capital

Table 17 provides details of working capital requirements for the project.

Table 17: Initial Working Capital Details

Particulars	No. of Months	Total Cost (PKR)
Consumables inventory	1	38,967
Raw material inventory	1	9,376,721
Upfront building rent		195,060
Cash		2,000,000
Total Working Capital		11,610,747

9.2. Breakeven Analysis

Table 18 shows calculation of break-even analysis.

Table 18: Breakeven Analysis

Particulars	Amount First Year (PKR)	Profitability Ratio
Sales (PKR) – A	126,940,128	100%
Variable Cost (PKR) – B	85,140,073	67%
Contribution (PKR) (A-B) = C	41,800,055	33%
Fixed Cost (PKR) – D	26,634,054	21%
Contribution Margin	33%	
Breakeven Analysis		
Breakeven Revenue (PKR)		80,883,391
Break-Even (liter)		57,805
Break-Even (bottles)		770,730
Breakeven Capacity		40%

9.3. Revenue Generation

Table 19 provides details regarding revenue generation from the manufacturing for Sealants during the first year of its operations.

Table 19: Revenue Details

Products	Total Revenue (PKR) (Retail)	Total Revenue (PKR) (Wholesale)	Total Revenue (PKR)
Silicon Sealant			
Silicon Sealant-50 ml	9,737,280	21,746,592	31,483,872
Silicon Sealant-300 ml	6,491,520	14,389,536	20,881,056
Acrylic Sealant			
Acrylic Sealant-50 ml	13,910,400	30,834,720	44,745,120
Acrylic Sealant-300 ml	9,273,600	20,556,480	29,830,080
Total	39,412,800	87,527,328	126,940,128

9.4. Variable Cost Estimate

Variable costs of the project have been provided in Table 20.

Table 20: Variable Cost Estimate

Description of Costs	Amount (PKR)
Material Cost	56,260,323
Labour	8,160,000
Packing Cost-Acrylic Sealant	9,103,584
Packing Cost-Silicon Sealant	7,282,867
Direct Electricity	643,592
Lab Consumable	167,600
Office vehicles Fuel Cost-Carry Van	414,400
Generator Fuel cost	134,266
Other Consumable	66,200
Communications expense (phone, fax, mail, internet, etc.)	613,440
Vehicle Maintenance Cost-Motorcycle	21,600
Bad debt expense	1,269,401
Vehicle Maintenance Cost- Carry van	102,000
Office vehicles Fuel Cost-motor cycle	82,880
Office expenses (stationery, entertainment, janitorial services, etc.)	817,920
Total Variable Cost (PKR)	85,140,073

Table 21: Raw Material Cost

Products	Product Sold during the Year (Units) (A)	Material Cost Per Unit (PKR) (B)	TotalCost (PKR) (A*B)
Silicon Sealant-50 ml	463,680	29.08	13,484,626
Silicon Sealant-300 ml	51,520	174.49	8,989,751
Total Raw Material Cost Silicone Sealant			22,474,376
Acrylic Sealant-50 ml	579,600	34.98	20,271,568
Acrylic Sealant-300 ml	64,400	209.85	13,514,379
Total Raw Material Cost Acrylic Sealant			33,785,947

Table 22 : Raw Material Cost-Acrylic Sealant-Per Liter

(All quantities are in liter)

Raw material / Input name	Cost per Liter (PKR)	Consumption per (Liter)	Cost (PKR)
Nonionic Surfactant			
(Triton X-405)	1.28	280	359.52
Ethylene Glycol	0.80	400	321.60
Titanium Dioxide (76% slurry)			-
(TIPURE R942)	19.33	420	8,119.44
Anionic thickener			-
(Acrysol TT615)	4.81	400	1,924.80
Solid Fume Silica			-
Cab-O-Sil M5	6.42	40	256.80
Zinc Oxide Permixon	26.06	1,150	29,973.60
Defoamer			
(Nopco NXZ)	1.28	790	1,014.36
Total Cost (Per Liter) PKR	41,970.12		
No of Tube (50ml) per 1 Liter	1,200		
Cost per Bottle-50ml	34.98		
No of Tube (300ml) per 1 Liter	200		
Cost Per Cartridge-300ml	209.85		

Table 23 : Raw Material Cost - Silicone Sealant-Per Liter

(All quantities are in liter)

Raw material / Input name	Standard Ratio Per Batch (Liters)	Raw Material cost/Liter (PKR)	R.M Cost/ Batch (PKR)
vHydroxyl Endblocked Polydimethylsiloxane	28.73	620	17,811.36
Nm-Class Active Calcium Carbonate	20.11	120	2,413.44
Thermal Silica	1.15	3,200	3,686.40
Methyl Tributanoximo Silane	2.40	1,800	4,320.00
long-chain liquid silicone	6.23	550	3,425.40

γ-Aminopropyl Triethoxysilane	0.71	1,250	892.50
Organosilicon Sealant Mould Inhibitor	0.38	5,300	2,003.40
Dibutyl Tin Laurate	0.29	1,200	345.60
Total Cost (Per Batch) PKR	34,898.10		
No of Tube (50ml) per 1 Liter	1,200		
Cost per Bottle-50ml	29.08		
No of Tube (300ml) per 1 Liter	200.00		
Cost Per Cartridge-300ml	174.49		

Table 24: Packing Cost

Products	Product Sold during the Year (Units) (A)	PackingCost Per Unit (PKR) (B)	TotalCost (PKR) (A*B)
Silicon Sealant-50 ml	463,680	12.4	5,768,179
Silicon Sealant-300 ml	51,520	29.4	1,514,688
Total Silicone Sealant Packing Cost			7,282,867
Acrylic Sealant-50 ml	579,600	12.4	7,210,224
Acrylic Sealant-300 ml	64,400	29.4	1,893,360
Total Acrylic Sealant Packing Cost	1,159,200		9,103,584

Table 25: Other Consumables

Cost Item	No	Unit Cost (PKR)	Total Cost (PKR)
Rubber Gloves	30	300	9,000
Protective Suits	20	2,500	50,000
Safety Glasses	30	240	7,200
Total			66,200

Table 26: Lab Consumables

Cost Item	No	Unit Cost (PKR)	Total Cost (PKR)
Burette 50 ml	10	850	8,500

Graduated cylinder 100 ml	10	600	6,000
Electronic Measuring Cups 5 liters	10	7,000	70,000
Test Tubes	100	50	5,000
3 layer test tube stand 50 holes	4	2,000	8,000
Test Tube Holder	10	60	600
Magnetic Mixer 300 ml	4	5,000	20,000
lab Gloves-box	10	1,000	10,000
Face Mask-box	10	500	5,000
Petri dish (10 pcs)	5	850	4,250
Glass Beaker (set of 5)	5	1,850	9,250
Glass stirrer set of 3	4	1,500	6,000
Conical Flask (set of 5)	5	3,000	15,000
Total			167,600

Table 27: Vehicle Maintenance Cost-

Particulars	Motorcycle	Carry Van
Oil Change per Year	7200	30,000
General maintenance	14400	72,000
Yearly Cost	21,600	102,000

Table 28: Direct Labor

Personnel	Number of Personnel	Salary per Head (PKR)	Annual Salaries (PKR)
Manager Production	1	100,000	1,200,000
Production Supervisor	1	70,000	840,000
Labour Skilled-Material Mixing	2	35,000	840,000
Labour Unskilled-Material Mixing	4	25,000	1,200,000
Labour Skilled-Bottle Filling Machine	2	35,000	840,000
Labour Unskilled-Bottle Filling Machine	4	25,000	1,200,000
Packing Staff	2	30,000	720,000

Quality Control officer	1	70,000	840,000
Quality Control Assistant	1	40,000	480,000
Total	18		8,160,000

9.5. Fixed Cost Estimate

Table 29 shows the estimated fixed cost of the project.

Table 29: Fixed Cost Estimate

Description of Costs	Amount (PKR)
Administration expense	10,224,000
Administration benefits expense	1,838,400
Building rental expense	2,340,720
Indirect Electricity	361,187
Professional fees (legal, audit, consultants, etc.)	102,240
Promotional expense	6,347,006
Depreciation expense	1,909,052
Amortization of pre-operating costs	898,546
Amortization of legal, licensing, and training costs	7,900
Research and Development expense	2,538,803
Total Fixed Cost	26,634,054

9.6. Financial Feasibility Analysis

The financial feasibility analysis provides the information regarding projected Internal Rate of Return (IRR), Net Present Value (NPV) and Payback period of the study, which is shown in Table 30.

Table 30: Financial Feasibility Analysis

Description	Project
IRR	64%
NPV (PKR)	108,981,892
Payback Period (years)	2.24
Projection Years	10
Discount rate used for NPV	20%

9.7. Financial Feasibility Analysis with 50% Debt

The financial feasibility analysis provides the information regarding projected IRR, NPV and payback period of the study on the basis of Debt: Equity Model (50:50), which is shown in Table 31.

Table 31: Financial Feasibility Analysis with 50% Debt

Description	Project
IRR	64%
NPV (PKR)	162,221,948
Payback Period (years)	2.24
Projection Years	10
Discount rate used for NPV	14%

9.8. Human Resource Requirement

The proposed manufacturing unit shall require the workforce as provided in Table 32.

Table 32: Human Resource

Personnel	Number of Personnel	Salary per Head (PKR)	Annual Salaries (PKR)
Manager Production	1	100,000	1,200,000
Production Supervisor	1	70,000	840,000
Labour Skilled-Material Mixing	2	35,000	840,000
Labour Unskilled-Material Mixing	4	25,000	1,200,000
Labour Skilled-Bottle Filling Machine	2	35,000	840,000
Labour Unskilled-Bottle Filling Machine	4	25,000	1,200,000
Store Keeper	2	40,000	960,000
Procurement Officer	2	50,000	1,200,000
Accounts and Finance Manager	1	80,000	960,000
Accounts Officer	1	50,000	600,000
Admin and HR Manager	1	80,000	960,000

Wholesale Manager	1	80,000	960,000
Retail sale Manager	1	80,000	960,000
Marketing and Sales Officer	2	50,000	1,200,000
Admin and HR Officer	1	40,000	480,000
Packing Staff	2	30,000	720,000
Quality Control officer	1	70,000	840,000
Quality Control Assistant	1	40,000	480,000
Security Guard	4	22,000	1,056,000
Driver	1	30,000	360,000
Office Boy	2	22,000	528,000
Total	37		18,384,000

10. CONTACT DETAILS

The contact details of all the major suppliers of machinery and equipment and raw materials are given in Table 33.

Table 33: Contact Details

Name of Supplier	Location	Product	Contact	Websit/ Email
NewGenic Chemicals	Lahore	Chemical supplier	(042) 36301555	https://newgenic-chemicals.business.site/
Humayun Chemicals	Lahore	Chemical supplier	0321 8467933	http://humayunchemicals.com/
Shamshir Chemical Industries (Pvt) Ltd	Lahore	Chemical Manufacturer	(042) 37637564	https://www.lahoreindustry.com/shamshir-chemical-industries-co2424
Haq Chemicals	Peshawar	Chemical Manufacturer	0300 9346775	
Frontier Chemical Industries	Peshawar	Chemical Manufacturer	91823056	
Power Chemical Industries Limited	Faisalabad	Chemical Manufacturer	(041) 8530124	
Swan Chemical (private) limited	Sukkur	Chemical Manufacturer	0300 8178511	

NASA Chemicals (private) Limited	Karachi	Chemical Manufacturer	(021) 32631753	
Sindh Chemicals	Sukkur	Chemical Manufacturer	03401137765	
Medsinglong co Ltd	China	Equipments		http://medmsl.com
Guangzhou Lianmeng Machinery Equipment Co., Ltd.	China	Packaging Machine and other production machines		http://www.lienm.com/en/
Jiangyin Ida Equipment Co., Ltd	China	Mixer and filling Machine	+8613585068675	http://www.idamill.com
Guangdong Shanghang Technology Limited	China	Production Machinery		http://zonesuntech.com
Unipet (Pvt) Ltd	Lahore	Tubes and Cartridges	(042) 35716951	
plastic pet bottles	Lahore	Tubes and Cartridges	0333 4906214	
Plaspak	Lahore	Tubes and Cartridges	(042) 35115855	
PlasPet (Pet Bottles manufacturers)	Karachi	Tubes and Cartridges	0321 3808373	
Urooj plastic	Karachi	Tubes and Cartridges	0342 2255066	
AL RAFAY Plastic and Pet Bottle	Karachi	Tubes and Cartridges	0315 3530622	

11. USEFUL LINKS

Table 34: Useful Links

Name of Organization	E-mail Address
Small and Medium Enterprises Development Authority (SMEDA)	www.smeda.org.pk
National Business Development Program (NBDP)	www.nbdp.org.pk
Government of Pakistan	www.pakistan.gov.pk
Ministry of National Health Services Regulations and Coordination	www.nhsrsc.gov.pk
Ministry of Federal Education and Professional Training	www.mofept.gov.pk
Government of Punjab	www.punjab.gov.pk
Government of Sindh	sindh.gov.pk/
Government of Balochistan	balochistan.gov.pk/
Government of KPK	kp.gov.pk/
Government of Gilgit Baltistan	gilgitbaltistan.gov.pk/
Government of Azad Jammu & Kashmir	ajk.gov.pk/
Trade Development Authority of Pakistan	www.tdap.gov.pk
Securities and Exchange Commission of Pakistan	www.secp.gov.pk
State Bank of Pakistan	www.sbp.gov.pk
Federal Board of Revenue	www.fbr.gov.pk
Federation of Pakistan Chambers of Commerce and Industry (FPCCI)	www.fpcci.com.pk
Pakistan Stock Exchange (PSX)	www.psx.com.pk
Pakistan Standards and Quality Control Authority (PSQCA)	http://www.psqca.com.pk
Punjab Small Industries Corporation	https://www.psic.gop.pk/
Sindh Small Industries Corporation	https://ssic.gos.pk/
Government of KPK	https://small_industries_de.kp.gov.pk/
Government of Balochistan Industries and Commerce	https://balochistan.gov.pk/departments-download/industries-and-commerce/

12. ANNEXURES

12.1. Income Statement

Income Statement										
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Revenue										
<i>Silicon Sealant</i>										
Silicone Sealant-50 ml	31,483,872	42,367,253	53,883,028	67,446,881	79,361,451	88,443,890	98,349,605	109,364,761	121,613,615	135,234,339
Silicone Sealant-300 ml	20,881,056	28,099,394	35,736,520	44,732,997	52,634,708	58,658,662	65,228,433	72,534,017	80,657,827	89,691,503
Total	52,364,928	70,466,647	89,619,548	112,179,878	131,996,159	147,102,552	163,578,038	181,898,778	202,271,441	224,925,843
<i>Acrylic Sealant</i>										
Acrylic Sealant-50 ml	44,745,120	60,212,665	76,578,972	95,856,024	112,789,102	125,697,134	139,775,213	155,430,036	172,838,200	192,196,079
Acrylic Sealant-300 ml	29,830,080	38,699,385	49,181,800	61,526,192	72,218,313	80,306,765	89,301,122	99,302,848	110,424,767	122,792,341
Total	74,575,200	98,912,050	125,760,772	157,382,217	185,007,416	206,003,898	229,076,335	254,732,884	283,262,967	314,988,419
Revenue	126,940,128	169,378,698	215,380,319	269,562,095	317,003,575	353,106,450	392,654,373	436,631,662	485,534,409	539,914,262
Cost of sales										
Raw material Silicon Sealant	22,474,376	30,243,410	38,463,596	48,146,210	56,651,111	63,134,587	70,205,661	78,068,695	86,812,389	96,535,377
Raw material Acrylic Sealant	33,785,947	44,811,643	56,975,331	71,301,279	83,816,747	93,329,105	103,781,965	115,405,545	128,330,966	142,704,035
Packing Cost-Silicon Sealant	7,282,867	9,800,428	12,464,228	15,601,864	18,357,921	20,458,891	22,750,287	25,298,319	28,131,731	31,282,484
Packing Cost-Acrylic Sealant	9,103,584	12,158,971	15,461,570	19,351,390	22,758,629	25,352,014	28,191,440	31,348,881	34,859,956	38,764,271
Direct Electricity	643,592	761,928	896,352	1,048,800	1,182,310	1,288,718	1,404,703	1,531,126	1,668,927	1,819,131
Direct Labour	8,160,000	8,951,520	9,819,817	10,772,340	11,817,257	12,963,531	14,220,993	15,600,429	17,113,671	18,773,697
Lab Consumable	167,600	186,371	207,245	230,456	256,267	284,969	316,886	352,377	391,843	435,730
Generator Fuel cost	134,266	172,464	217,009	268,793	312,382	343,933	378,670	416,916	459,024	505,386
Office vehicles Fuel Cost-Carry Van	414,400	456,254	502,336	553,072	608,932	670,434	738,148	812,701	894,784	985,157
Total cost of sales	82,166,632	107,542,990	135,007,485	167,274,205	195,761,557	217,826,183	241,988,753	268,834,990	298,663,292	331,805,267
Gross Profit	44,773,496	61,835,708	80,372,834	102,287,890	121,242,018	135,280,267	150,665,620	167,796,673	186,871,117	208,108,995
<i>General administration & selling expenses</i>										
Administration expense	10,224,000	11,215,728	12,303,654	13,497,108	14,806,327	16,242,541	17,818,068	19,546,420	21,442,423	23,522,338
Administration benefits expense	1,838,400	2,016,725	2,212,347	2,426,945	2,662,358	2,920,607	3,203,906	3,514,685	3,855,609	4,229,604
Building rental expense	2,340,720	2,574,792	2,832,271	3,115,498	3,427,048	3,769,753	4,146,728	4,561,401	5,017,541	5,519,295
Indirect Electricity	361,187	427,598	503,037	588,591	663,518	723,234	788,325	859,274	936,609	1,020,904
Other Consumable	66,200	73,614	81,859	91,027	101,223	112,559	125,166	139,185	154,773	172,108
Vehicle Maintenance Cost- Carry van	102,000	112,302	123,645	136,133	149,882	165,020	181,687	200,037	220,241	242,486
Office vehicles Fuel Cost-motor cycle	82,880	92,163	102,485	113,963	126,727	140,920	156,703	174,254	193,771	215,473
Communications expense (phone, fax, mail, internet, etc.)	613,440	672,944	738,219	809,826	888,380	974,552	1,069,084	1,172,785	1,286,545	1,411,340
Vehicle Maintenance Cost-Motorcycle	21,600	23,782	26,184	28,828	31,740	34,945	38,475	42,361	46,639	51,350
Office expenses (stationery, entertainment, janitorial services, etc.)	817,920	897,258	984,292	1,079,769	1,184,506	1,299,403	1,425,445	1,563,714	1,715,394	1,881,787
Reasearch and Development expense	2,538,803	3,766,982	5,326,545	7,413,157	9,694,230	12,007,693	14,848,041	18,360,256	22,703,264	28,073,585
Promotional expense	6,347,006	8,468,935	10,769,016	13,478,105	15,850,179	17,655,323	19,632,719	21,831,583	24,276,720	26,995,713
Professional fees (legal, audit, consultants, etc.)	102,240	112,157	123,037	134,971	148,063	162,425	178,181	195,464	214,424	235,223
Depreciation expense	1,909,052	1,909,052	1,909,052	1,909,052	1,909,052	1,909,052	1,289,677	3,507,753	3,507,753	3,507,753
Amortization of pre-operating costs	898,546	898,546	898,546	898,546	898,546	-	-	-	-	-
Amortization of legal, licensing, and training costs	7,900	7,900	7,900	7,900	7,900	7,900	7,900	7,900	7,900	7,900
Bad debt expense	1,269,401	1,693,787	2,153,803	2,695,621	3,170,036	3,531,065	3,926,544	4,366,317	4,855,344	5,399,143
Subtotal	29,541,295	34,964,264	41,095,890	48,425,040	55,719,714	61,656,994	68,836,649	80,043,390	90,434,953	102,486,002
Operating Income	15,232,201	26,871,444	39,276,944	53,862,851	65,522,304	73,623,273	81,828,971	87,753,283	96,436,164	105,622,993
Gain / (loss) on sale of machinery & equipment	-	-	-	-	-	-	1,995,500	-	-	-
Gain / (loss) on sale of office equipment	-	-	-	-	-	-	413,000	-	-	-
Gain / (loss) on sale of office vehicles	-	-	-	-	-	-	323,375	-	-	-
Earnings Before Interest & Taxes	15,232,201	26,871,444	39,276,944	53,862,851	65,522,304	73,623,273	84,560,846	87,753,283	96,436,164	105,622,993
Earnings Before Tax	15,232,201	26,871,444	39,276,944	53,862,851	65,522,304	73,623,273	84,560,846	87,753,283	96,436,164	105,622,993
Tax	3,233,855	6,434,647	10,078,083	14,453,855	17,951,691	20,381,982	23,663,254	24,620,985	27,225,849	29,981,898
NET PROFIT/(LOSS) AFTER TAX	11,998,346	20,436,797	29,198,861	39,408,995	47,570,613	53,241,291	60,897,592	63,132,298	69,210,315	75,641,095

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											
<i>Current assets</i>											
Cash & Bank	2,000,000	2,297,782	6,753,215	9,016,763	11,670,677	13,789,438	58,440,736	85,377,858	137,267,445	192,119,779	356,631,800
Accounts receivable		6,955,623	8,118,324	10,541,343	13,286,094	16,070,292	18,359,179	20,431,803	22,720,165	25,264,824	28,094,484
Finished goods inventory		3,572,462	4,516,806	5,666,302	7,016,679	8,192,664	9,097,148	10,106,257	11,227,445	12,473,175	13,857,294
Consumables inventory	38,967	42,707	46,807	51,301	56,226	61,623	67,539	74,023	81,129	88,918	97,454
Raw material inventory	9,376,721	13,772,602	19,281,860	26,569,766	34,401,310	42,188,970	51,652,462	63,238,729	77,423,935	94,791,053	-
Pre-paid building rent	195,060	214,566	236,023	259,625	285,587	314,146	345,561	380,117	418,128	459,941	-
Total Current Assets	11,610,747	26,855,744	38,953,035	52,105,100	66,716,573	80,617,134	137,962,624	179,608,788	249,138,248	325,197,689	398,681,032
<i>Fixed assets</i>											
Land	-	-	-	-	-	-	-	-	-	-	-
Building / Infrastructure	509,265	458,339	407,412	356,486	305,559	254,633	203,706	152,780	101,853	50,927	-
Machinery & equipment	7,982,000	6,784,700	5,587,400	4,390,100	3,192,800	1,995,500	798,200	15,163,016	12,888,564	10,614,111	8,339,659
Furniture & fixtures	1,460,000	1,241,000	1,022,000	803,000	584,000	365,000	146,000	2,773,491	2,357,467	1,941,444	1,525,420
Office vehicles	1,293,500	1,099,475	905,450	711,425	517,400	323,375	129,350	1,970,780	1,675,163	1,379,546	1,083,929
Office equipment	1,652,000	1,404,200	1,156,400	908,600	660,800	413,000	165,200	3,138,224	2,667,490	2,196,757	1,726,023
Security Against Building	585,180	585,180	585,180	585,180	585,180	585,180	585,180	585,180	585,180	585,180	585,180
Total Fixed Assets	13,481,945	11,572,894	9,663,842	7,754,791	5,845,739	3,936,688	2,027,636	23,783,470	20,275,717	16,767,964	13,260,211
<i>Intangible assets</i>											
Pre-operation costs	4,492,732	3,594,185	2,695,639	1,797,093	898,546	-	-	-	-	-	-
Legal, licensing, & training costs	79,000	71,100	63,200	55,300	47,400	39,500	31,600	23,700	15,800	7,900	-
Total Intangible Assets	4,571,732	3,665,285	2,758,839	1,852,393	945,946	39,500	31,600	23,700	15,800	7,900	-
TOTAL ASSETS	29,664,424	42,093,923	51,375,716	61,712,283	73,508,259	84,593,321	140,021,860	203,415,958	269,429,765	341,973,553	411,941,243
Liabilities & Shareholders' Equity											
<i>Current liabilities</i>											
Accounts payable		6,430,326	8,493,307	10,839,437	13,535,126	15,989,236	18,176,484	20,672,989	23,554,499	26,887,972	21,214,567
Total Current Liabilities	-	6,430,326	8,493,307	10,839,437	13,535,126	15,989,236	18,176,484	20,672,989	23,554,499	26,887,972	21,214,567
<i>Shareholders' equity</i>											
Paid-up capital	29,664,424	29,664,424	29,664,424	29,664,424	29,664,424	29,664,424	29,664,424	29,664,424	29,664,424	29,664,424	29,664,424
Retained earnings		5,999,173	13,217,985	21,208,423	30,308,709	38,939,661	92,180,952	153,078,545	216,210,842	285,421,157	361,062,252
Total Equity	29,664,424	35,663,597	42,882,409	50,872,846	59,973,133	68,604,085	121,845,376	182,742,968	245,875,266	315,085,581	390,726,676
TOTAL CAPITAL AND LIABILITIES	29,664,424	42,093,923	51,375,716	61,712,283	73,508,259	84,593,321	140,021,860	203,415,958	269,429,765	341,973,553	411,941,243

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
<i>Operating activities</i>											
Net profit		11,998,346	20,436,797	29,198,861	39,408,995	47,570,613	53,241,291	60,897,592	63,132,298	69,210,315	75,641,095
Add: depreciation expense		1,909,052	1,909,052	1,909,052	1,909,052	1,909,052	1,909,052	1,289,677	3,507,753	3,507,753	3,507,753
amortization of pre-operating costs		898,546	898,546	898,546	898,546	898,546	-	-	-	-	-
amortization of training costs		7,900	7,900	7,900	7,900	7,900	7,900	7,900	7,900	7,900	7,900
Deferred income tax		-	-	-	-	-	-	-	-	-	-
Accounts receivable		(6,955,623)	(1,162,701)	(2,423,019)	(2,744,751)	(2,784,199)	(2,288,886)	(2,072,625)	(2,288,362)	(2,544,659)	(2,829,660)
Finished goods inventory		(3,572,462)	(944,343)	(1,149,496)	(1,350,378)	(1,175,985)	(904,483)	(1,009,109)	(1,121,188)	(1,245,729)	(1,384,119)
Equipment inventory	(38,967)	(3,741)	(4,100)	(4,494)	(4,925)	(5,398)	(5,916)	(6,484)	(7,106)	(7,788)	(8,536)
Raw material inventory	(9,376,721)	(4,395,882)	(5,509,258)	(7,287,906)	(7,831,544)	(7,787,659)	(9,463,492)	(11,586,267)	(14,185,206)	(17,367,118)	94,791,053
Pre-paid building rent	(195,060)	(19,506)	(21,457)	(23,602)	(25,962)	(28,559)	(31,415)	(34,556)	(38,012)	(41,813)	459,941
Accounts payable		6,430,326	2,062,981	2,346,129	2,695,689	2,454,110	2,187,248	2,496,505	2,881,509	3,333,474	(5,673,406)
Other liabilities		-	-	-	-	-	-	-	-	-	-
Cash provided by operations	(9,610,747)	6,296,955	17,673,418	23,471,971	32,962,623	41,058,422	44,651,298	49,982,633	51,889,586	54,852,335	164,512,021
<i>Financing activities</i>											
Issuance of shares	29,664,424	-	-	-	-	-	-	-	-	-	-
Purchase of (treasury) shares											
Cash provided by / (used for) financing activities	29,664,424	-	-	-	-	-	-	-	-	-	-
<i>Investing activities</i>											
Capital expenditure	(18,053,677)	-	-	-	-	-	-	(23,045,511)	-	-	-
Acquisitions											
Cash (used for) / provided by investing activities	(18,053,677)	-	-	-	-	-	-	(23,045,511)	-	-	-
NET CASH	2,000,000	6,296,955	17,673,418	23,471,971	32,962,623	41,058,422	44,651,298	26,937,122	51,889,586	54,852,335	164,512,021

13. KEY ASSUMPTIONS

13.1. Operating Cost Assumptions

Table 35: Operating Cost Assumptions

Description	Details
Operating costs growth rate	10.1%
Administration benefits expense	10% of HR Salaries
Communication expenses	6% of administration expenses
Office expenses (stationery, janitor, etc.)	8% of administration expenses
Promotional Expense	5% of revenue
Depreciation	
Building	10% of Building Cost
Machinery and Equipment	15% of Cost
Office Equipment/Office Vehicle/Furniture and Fixture	15% of Cost

13.2. Revenue Assumptions

Table 36: Revenue Assumptions

Description	Details
Sale price growth rate	11.2%
Capacity utilization	60%
Capacity utilization growth rate	10%
Maximum capacity	95%

13.3. Financial Assumptions

Table 37: Financial Assumptions

Description	Details
Project life (Years)	10
Debt: Equity	0:100
Discount Rate	15%

13.4. Debt Related Assumptions

Table 38: Debt Related Assumption

Description of Cost	Details
Project Life (Years)	10

Debt: Equity	50:50
Discount Rate	13%
Debt Grace Period	1 Years
Interest Rate (KIBOR+3%)	11.3%

13.5. Cash Flow Assumptions

Table 39: Cash Flow Assumptions

Description	Details
Accounts receivable cycle (in days)	20 Days
Accounts payable cycle (in days)	30 Days

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