Pre-feasibility Study

METAL INJECTION MOLDING TECHNOLOGY

January 2023

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

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

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2. EXECUTIVE SUMMARY

Metal Injection Molding (MIM) is a modern technology capable of producing high quality metal parts, produced in finished form and not requiring any further machining operations. It is also known as MIM Casting. MIM technology is suitable for producing smaller parts. For example, in case of arms products, it will be the internal parts which can be produced by this technology.

Metal casting can be done by either reusable or expendable molds. There are different types of metal casting methods such as sand casting, precision casting and high pressure metal die casting. However, the advance technology for producing small metal parts is MIM because ferrous parts of different products cannot be produced through High Pressure Metal Die casting. In spite of the fact that Pakistan has a large light engineering industry, MIM technology is not commonly used in the country. As per the available information, there is only one unit operating in Khyber Pakhtunkhwa which is using MIM as a manufacturing technique.

This technology can be used by numerous industries to manufacture a variety of meal parts for their products, including those in the automotive, medical and dental, firearms, hardware, textile machinery, lock industries, as well as for applications in aerospace and military sectors.

The proposed business unit of “Metal Injection Molding Technology” will manufacture small internal parts of firearms (pistols and shotguns). These products include trigger components, magazine release, operating rods, hammers, triggers, bolts, handles, and stops, disassembly lever, safeties, hinges and locks, mounts, sights and housings.

The proposed manufacturing unit would ideally be located in major cities of Pakistan like Lahore, Karachi, Faisalabad, Hyderabad, Multan, Sialkot, Gujranwala, and Peshawar and other cities of Pakistan. These cities have also been proposed due to the presence of industrial sectors and target industries.

This manufacturing unit will be set up in a rented building with an area of 4,950 square feet (22 Marla). The proposed business requires a total investment of PKR 118.46 million. This includes capital investment of PKR 103.96 million and working capital of PKR 14.50 million. The project will be established using 100% equity financing. The Net Present Value (NPV) of project is PKR 121.43 million with an Internal Rate of Return (IRR) of 42% and a Payback period of 3.32 years. Further, this project is expected to generate Gross Annual Revenues of PKR 269.82 million during 1st year, Gross Profit (GP) ratio ranging from 21% to 34% and Net Profit (NP) ratio ranging from 6% to 18% during the projection period of ten years. The proposed project will achieve its estimated breakeven point at capacity of 26% (896,084 parts) with annual breakeven revenue of PKR 118.45 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 159.99 million, Internal Rate of Return (IRR) of 42% and Payback period of 3.30 years. Further, this project is expected to generate Net Profit (NP) ratio ranging

from 6% to 18% during the projection period of ten years. The proposed project will achieve its estimated breakeven point at capacity of 28% (947,019 parts) with breakeven revenue of PKR 125.18 million.

The proposed project will provide employment opportunities to 65 people, working 3 shifts of 7 hours each during 300 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 “Sole Proprietorship” 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 "Metal Injection Molding Technology" 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

Metal Injection Molding (MIM) is a manufacturing technology that combines the traditional Powder Metallurgy[1] with plastic injection molding to make different types of metal parts. The technology is capable of producing high quality metal parts, produced in finished form and not requiring any further machining operations. Over the past, the MIM technology has established itself as a reliable and competitive manufacturing process for small precision components. MIM technology is suitable for producing smaller parts which require high degree of precision.

There are a wide variety of materials available for metal injection molding, and they generally fall into four categories:

- Ferrous alloys—steels, stainless steels, tool steels, iron-nickel magnetic alloys, and specialty ferrous alloys such as Invar and Kovar
- Tungsten alloys—tungsten heavy alloys and tungsten-copper
- Hard materials—cemented carbides (WC-Co), and cermets (Fe-TiC)
- Special materials that include, precious metals, titanium alloys, cobalt-chromium, nickel, nickel-base super alloys, molybdenum, molybdenum-copper, and particulate composites.

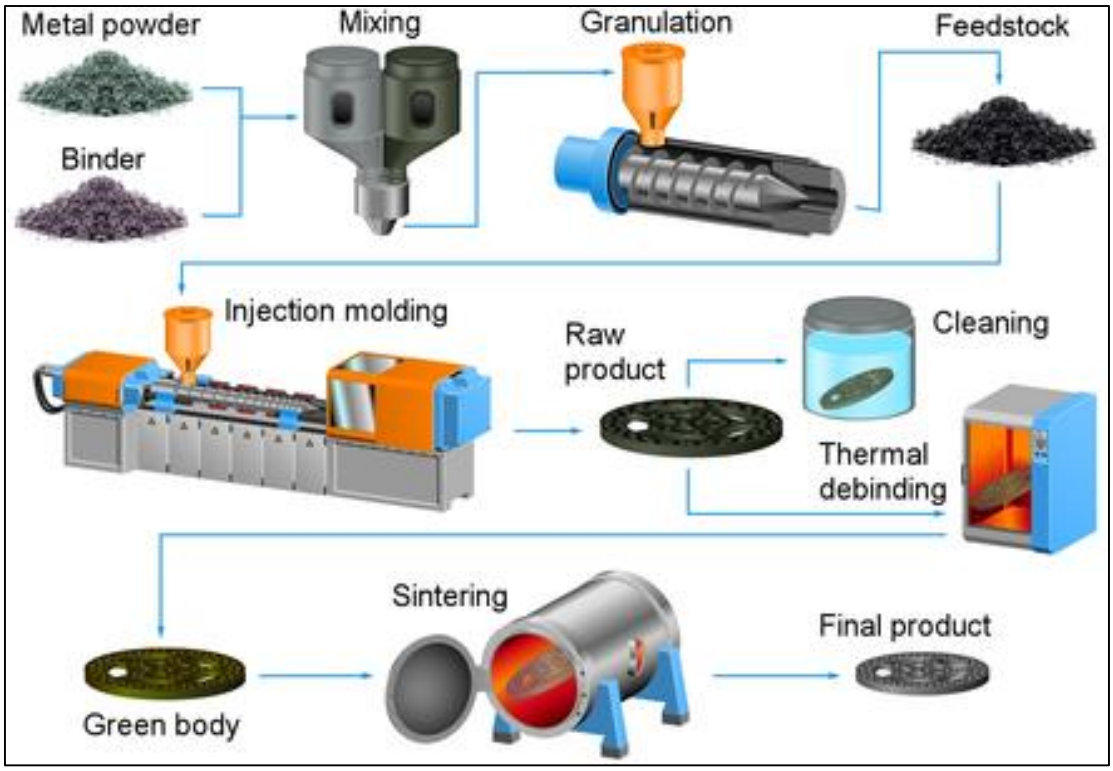
The technology is suitable for all types of metals, both ferrous (iron & steel) and non-ferrous metal. However, it has a special advantage for producing ferrous parts. Parts of non-ferrous metals (aluminium, zinc, copper, etc.) can be made easily by using High Pressure Die Casting technology. These metals have low melting points and thus can be easily melted and forced into ferrous materials molds to make the desired parts. However, this is not possible if one has to make parts from ferrous metals.

[1] Powder metallurgy is a metal-forming process performed by heating compacted metal powders to just below their melting points. The process generally consists of three basic steps: powder blending (pulverization), die compaction, and sintering.

The reason for this is the high melting point of iron and steel. The molds used for High Pressure Die Casting are made of ferrous metals. When iron and steel is melted at around 1500C and poured into those molds, the molten metal melts the molds as well. Mold thus gets damaged and the part of the desired design and shape cannot be manufactured. In MIM, metals are not completely melted which makes this technology suitable for making ferrous parts also.

The standard powder metallurgy can achieve only 80-90% of theoretical density whereas MIM can achieve 95-100%. This makes it possible to achieve close tolerances and reduce costs by producing small, complex parts over high production runs. The steps involved in the production of a metal parts using MIM are schematically shown in Figure 1.

Figure 1: Metal Injection Molding Process



Metal Injection Molding technology today is being practiced in more than 100 countries and its production is continuously increasing. In developed countries, MIM technology has gained popularity in different industries such as automotive, medical and dental, firearms, hardware, and lock industries, as well as the aerospace and military etc. They have almost completely converted to this technology for producing small parts with better quality and efficiency of time and production. In Pakistan, this technology has not gained popularity since there is lack of knowledge about the benefits of this technology.

Benefits of MIM Technology

Metal Injection Molding Technology is used by numerous industries to manufacture a wide variety of parts for their products. MIM technology has multiple advantages, some of these are discussed below:

Mass Production

MIM technology can be used for producing large volumes, which is not possible through conventional machining operations. Having MIM facility provides the opportunity to serve to bigger orders in local and export markets. While mass production is presented as an advantage, it sometimes also becomes a limitation since producing smaller volumes on MIM facility increases the cost and may make the proposition infeasible in some cases.

Suitability for all Types of Metals

MIM technology can be used for making parts from all types of metals and alloys, including ferrous as well as nonferrous materials. These include high strength steels, stainless steels, refractory metals, titanium and copper alloys and low melting allows like brass, bronze, zinc and Aluminium. This is very relevant and beneficial for the arms products since different parts in any one type of weapon are often made from different metals.

Intricate Designs Production

It is possible to produce intricate designs using MIM technology which in many cases is not possible through conventional manufacturing methods. Figure 2 shows some complex parts made through MIM process.

Figure 2: Parts Made through MIM Technology

High Degree of Precision

Metal Injection Molding technology can produce parts with higher degree of precision, compared to that obtained through machining or other casting methods. This is a prime consideration while producing internal parts of different types of arms. Typical MIM

tolerances range from ± 0.3% to 0.5% of the dimension. However, tolerances are highly dependent upon product geometry.

Standardization of Parts

MIM technology has the capability to produce standardized parts. All the parts produced from the same feedstock, same mold and same process conditions will be same in their intricate dimensions. This standardization is an important requirement for arms products where interchangeability is a desired attribute. MIM technology can produce parts that can offer full interchangeability in the weapons.

Production of Ready-to-Use Parts

The parts produced through MIM technology do not require any further treatment and can be used directly at their place of application. This is not the case with the parts produced through machining or other casting methods. For example, the parts made through sand casting or investment casting have to be machined to bring them into ready-to-use condition.

Application of MIM Technology in Different Industries

The application of MIM technology in different industries is shown below:

Automotive Industry

The automotive sector has become a major consumer of Metal Injection Molded parts. High strength, high complexity parts are used in engines, gearboxes, turbochargers, locking mechanisms, steering systems and electronic systems which can be produced by MIM technology. Some of the examples include rocker arms for BMW engines, shift lever transmission component and vanes for variable nozzle turbochargers etc.

Medical and Dental Industry

The medical and dental industry is another industry with a wide range of uses of metal injecting molding technology. Medical MIM provides benefits to a full range of medically related applications including retinal, cochlear (for hearing) and dental implants, minimally invasive surgical devices, orthopedic implants, cardiac instruments, pacemakers and many more.

Firearms Industry

Firearms industry also uses metal injecting molding technology for producing multiple products to achieve high quality and efficiency. Some examples are safe and arm rotor, pistol upswept, grip safety part, etc.

Hardware and Lock Industries

In hardware and lock industries range of products are made using MIM technology as these items needs maximum accuracy for better functions. Some products made using this technology are the door hardware (lock housings, cylinders, carriers, pins), hand and power tools (handles, bits, keyless chucks, blade clamps, pawls, ratchet

mechanisms), electronics (sensor housings, fiber optic connectors, microwave packages, heatsinks) and safety (fall protection mechanisms) etc.

Aerospace Industry

Metal Injection Molding technology has found a number of applications in the aerospace sector, including high performance engine components, seatbelt parts, latches and fittings, spray nozzles and vane adjustment levers.

Military Industry

There are several advantages of MIM technology in developing defense equipment such as by using this molding technique with extremely tough components, the manufactured products have high strength and capability to perform even in the harshest conditions.

Products of the Proposed MIM Unit

The proposed business unit “Metal Injection Molding Technology” will manufacture small internal parts of different types of firearms. These products include trigger components, magazine release, operating rods, hammers, triggers, bolts, handles and stops, disassembly lever, safeties, hinges and locks, mounts, sights and housings. These are the main types of internal parts in pistols and shotguns.

These products have been included since these have high demand in the Pakistan as large volumes pistols, shotguns and weapons are being produced in Pakistan. Currently, these small parts of the firearms are produced either by machining, which is a very slow and tedious process, or by investment casting (also called precision casting or low wax casting) which does not produce finished parts and thus those parts have to be machined further to get the final finish before they may be used for the intended purposes.

The products of the proposed units are explained below:

Trigger Components

A trigger is a mechanism that actuates the function of a ranged weapon such as a firearm shot gun pistol etc. Following are the components of the trigger.

Trigger

Trigger is attached to firearm and helps in firing by providing support to the dis-connector. Disconnector is held by trigger when one loads a gun or pistol.

Disconnector

Disconnector is attached to the trigger. It holds the hammer when the gun is loaded. When trigger is pressed, it frees the hammer for hitting the bullet.

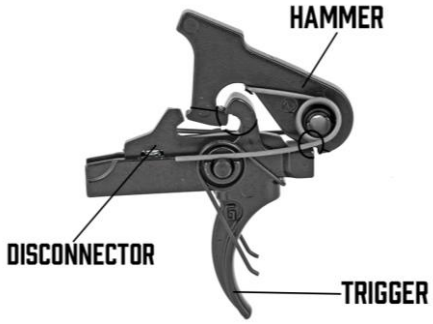
Hammer

Hammer is attached near the trigger to strike the bullet. It contains pin, which activates the bullet.

Hammer Pin

Hammer pin is attached in the hammer. It is in narrow in shape which easily strikes the bullet to fire. Hammer is of large size so it cannot hit the bullet and nor the spring or pin alone can provide such force to fire the bullet. That is why pin is attached to the trigger to fire or trigger the bullet. Figure 3 shows trigger components.

Figure 3: Trigger Components



Magazine Release

Mag Catch

Mag catches holds the magazine in the pistol which has the bullet for firing.

Mag Release Button

As mag catch holds the magazine, for the release of magazine, mag button is used. By pressing it, mag catch releases the magazine. Figure 4 shows magazine release.

Figure 4: Magazine Release

Operating Rods

Operating rod has the same diameter as a core barrel and is coupled with it. It gives additional rigidity to the core barrel and helps to prevent deflection of the borehole. It is also called core-barrel rod oversize rod. Figure **5** shows operating rods.

Figure 5**: Operating Rods**

Bolts, Bolt Handles and Bolt Stops

A bolt is the part of a repeating firearm that blocks the rear opening (breech) of the barrel chamber while the propellant burns, and moves back and forward to facilitate loading/unloading of cartridges from the magazine. Figure 6 shows bolt.

Figure 6: Bolt

Bolt handle is a device on a firearm which, when manipulated, results in the bolt being pulled to the rear, putting the hammer into a spring-loaded ready and 'set' position, allowing the operator to open the breech and eject any spent shell from the chamber. Figure 7 shows bolt handle.

Figure 7: Bolt Handle

A bolt stop works as to control the firing or bolt of the gun. It visually indicates when a handgun has expended all loaded ammunition and facilitates faster reloading by pulling back the slide or depressing the slide lock to advance the first round of a new magazine. By changing its position, firing of gun also changes. Figure 8 shows bolt stop.

Figure 8: Bolt Stop

Disassembly Lever

Disassembly Lever is a mechanism for the disassembly of a handgun without triggering, which prevents the consequential accidental firing of a cartridge in the chamber upon triggering. By sliding it, it will block the trigger, which prevent it firing. Figure 9 shows disassembly lever.

Figure 9: Disassembly Lever

Fire Safety

A safety is a device that blocks the action to prevent the firearm from shooting until the safety is released or pushed to the off position. Figure 10 shows fire safety.

Figure 10: Fire Safety

Hinges

Hinges are mechanical bearings that link two swinging objects or points to one another and allow them to move relative to each other about a fixed axis. Hinges allow limited movement, allowing the object to move only at one angle and restricting the other movements of swinging parts. Hinge is used in a shotgun for the break (or hinge) action. The barrels are pointed to the ground, a release is pressed and the barrels move downward allowing for the loading and unloading of cartridges. Figure 11 shows hinges.

Figure 11: Hinges

Sights

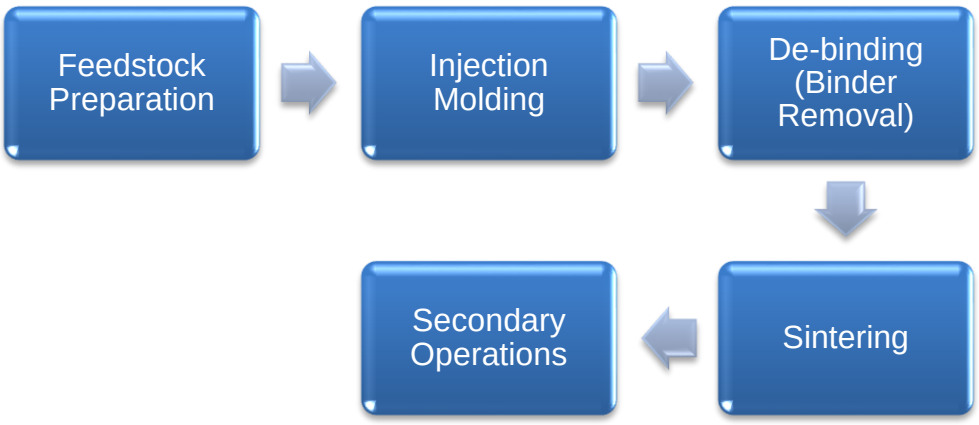
A sight is a mechanical piece or device on top of a firearm used to aid in aiming of a firearm. There are mostly two types of sights on a firearm rear sight and front sight. The rear sights are closer to the shooter's eyes whereas front sights are farther from the shooter's eyes. Figure 12 shows sights.

Figure 12: Sights

5.1. Process Flow for Metal Injection Molding Technology

A general process flow of a metal injection molding technology is shown in Figure 13.

Figure 13: Process Flow for Metal Injection Molding Technology



The brief description of process flow in as follows:

Feedstock Preparation

The primary raw materials for MIM are metal powders, thermoplastic and wax binders. The binder is only an intermediate processing aid and is removed from the products after injection molding. The properties of the powder determine the final properties of the MIM product. The blended powder mix is worked into the plastified binder at an elevated temperature using a kneader or shear roll extruder. The intermediate product is called feedstock. It is usually granulated with granule sizes of several millimeters, as is common in the plastic injection molding industry.

Feedstock of different metals can be purchased ready-to-mold from many international suppliers, or it can be manufactured in-house by a MIM producer if the necessary skills and knowledge are available. There is no issue in the availability of feedstock of any metal or alloy. Smaller volumes of feedstock are usually not sold by the suppliers. The suppliers usually demand to have larger orders.

Injection Molding

The feedstock, upon heating, becomes a viscous slurry which is injected under high pressure into an engineered mold to form the desired shape component. The injection molding process is equivalent to the forming of plastic parts. Once molded, the component is referred to as a Green Part. The variety of part geometries that can be produced by this process is similar to the great variety of plastic components. The geometry of the Green Part is identical to that of the finished piece, but to allow for shrinkage during the sintering phase, it is about 20% larger in size than the desired final size of the finished component. Upon cooling, the part is ejected from the mold. Figure 14 shows metal injection molding machine.

Figure 14: Metal Injection Molding Machine

De-binding (Binder Removal)

De-binding involves a controlled heating process to remove most of the binders. The binder removal process serves to obtain parts with an interconnected pore network without destroying the shape of the components. The process removes the binders and prepares the part for the final step – sintering. Once de-binding is complete, the

component is referred to as Brown Part. At the end of the binder removal process, there is often still some binder left in the parts holding the metal powder particles together, but the pore network allows the evaporation of the residual binder quickly in the initial phase of sintering.

Sintering

The Brown part is held together by a small amount of the binder and is very fragile. The sintering process is carried out in a furnace where the part is subjected to high temperatures near the melting point of the material. The conditions fuse the metal powder together into a near fully dense solid. The process leads to the elimination of most of the pore volume formerly occupied by the binder to give the part its final desired geometry. MIM parts exhibit a substantial shrinkage during sintering. The linear shrinkage is usually as high as 15 to 20%. The entire sintering process takes 15-20 hours.

Secondary Operations

To improve material properties, achieve tight tolerances, enhance cosmetic surface, or assemble other components, the sintered MIM parts may be further processed by conventional metal working processes such as heat treatments, surface treatments, forging, CNC machining, PVD coating, etc.

5.2. Installed and Operational Capacities

The proposed manufacturing unit will operate in a three shift of 7 hours in a day for 300 days in a year. Further, it is assumed that the operational capacity for the manufacturing unit is 60% during the first year of its operations. The capacity will increase at the rate of 5% per annum attaining a capacity of maximum of 90% of its total manufacturing capacity during the projected period of 10 years. The manufacturing unit will manufacture 3,402,000 different parts at maximum capacity which include 510,300 trigger components, 340,200 operating rods, 510,300 magazine releases, 170,100 hammers, 510,300 triggers, 340,200 disassembly levers, 170,100 mounts, sights and housings, 510,300 bolts, handles, and stops and 340,200 safeties, hinges, and locks.

The initial year manufacturing capacity of the proposed manufacturing unit is assumed to be 60% at which the proposed unit will manufacture 2,041,200 different parts which include 306,180 trigger components, 204,120 operating rods, 306,180 magazine release, 102,060 hammers, 306,180 triggers, 204,120 disassembly lever, 102,060 mounts, sights and housings, 306,180 bolts, handles, and stops and 204,120 safeties, hinges, and locks.

Table 1: Installed Capacity-Parts Production

Cycle time (seconds) (A)	Number of Seconds in an hour (B)	Number of Strokes in an hour (C=B/A)	Average No. of cavity in the mold (D)	Production per hour (No. of parts) (C*D)	Production per day (21 hour)	Production per month (25 days)	Prodcution Per year (parts)
40	3,600	90	6	540	11,340	283,500	3,402,000

Table 2: Installed Capacity-Product Wise

Parts	Production of Parts @ 100% Capacity	Ratio	Product Wise Production @100% Capacity	Product Wise Production @50% Capacity
Trigger components	3,402,000	15%	510,300	306,180
Operating rods		10%	340,200	204,120
Magazine release		15%	510,300	306,180
Hammers		5%	170,100	102,060
Triggers		15%	510,300	306,180
Disassembly lever		10%	340,200	204,120
Mounts, sights and housings		5%	170,100	102,060
Bolts, handles, and stops		15%	510,300	306,180
Safeties, hinges, and locks		10%	340,200	204,120
Total		**100%**	**3,402,000**	**2,041,200**

6. CRITICAL FACTORS

Before making the decision to invest in metal injection molding technology, one should carefully analyze the associated risk factors. The important considerations in this regard include:

- Good technical knowhow and knowledge of the industry
- Availability of specialized workforce
- Knowledge of market demand and supply
- Rigorous supervision of the production process at every level
- Ability to generate work orders through networking
- Assurance of timely order fulfillment
- Compliance with international quality control standards
- Availability of high quality raw materials (metal powders, binders, etc.)
- Availability of high quality materials required for carrying out processes, (e.g., an important requirement is highly pure nitrogen gas)

7. GEOGRAPHICAL POTENTIAL FOR INVESTMENT

The proposed project may be established in major cities including Lahore, Karachi, Faisalabad, Multan, Sialkot, Gujranwala, Peshawar, Hyderabad, etc. These areas are proposed due to following reasons:

Since MIM technology can be applied to any type of metal, its usefulness is applicable to wide majority of the sectors which are engaged in metal parts manufacturing. Thus, the demand for this technology will be much higher than that for any other casting technology. The demand for this technology can even be generated from major sectors in other provinces. Such as in Sialkot, certain types of surgical instruments may be made using MIM technology. The local auto sector can produce millions of parts per year using MIM technology as well as Textile industry which requires millions of spare parts every year can also produce these parts using MIM technology.

In the large cities of Pakistan, there are industrial sectors and large target industries due to which chances of availability of resources is high as compared to small cities so it will be beneficial to propose the project in large cities. Peshawar (and Dara Adam Khel) has large clusters for the production pistols and shotguns and the proposed project is producing products for these weapons. This is expected to open up more opportunities to grow.

8. POTENTIAL TARGET MARKETS/CUSTOMERS

Metal Injection Molding technology is very new to Pakistan. There is only one MIM facility in the country with the name PIM-Tech Pakistan Pvt. Ltd. The manufacturing facility is situated in Hattar Industrial Estate, Khyber Pakhtunkhwa and it can produce different types of metal parts using MIM technology. The company was established in 2018 and since then it has been providing services to manufacture metal parts for different industries.

There is no other MIM facility in the country, not even in public sector. Pakistan Ordinance Factory (POF) in Wah is the largest arms manufacturing organization operating in public sector. There is no MIM facility even in that factory. Many important parts to be used in different types of weapons are imported.

In contrast to Pakistan, there are fourteen MIM facilities in India. Major share of the production of those factories is exported. So, it will be beneficial for Pakistan to introduce this technology and develop industries. The potential market for this business will be any sector such as automotive, medical and dental, firearms, hardware, lock industries, textile machinery, as well as the aerospace and military. The market targeted by the proposed project includes the producers of pistols and shotguns.

9. PROJECT COST SUMMARY

A detailed financial model has been developed to analyze the commercial viability of Metal Injection Molding technology. 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 3 provides fixed and working capital requirements for establishment of metal injection molding technology.

Table 3: Initial Project Cost estimates

Particulars	Cost (PKR)	Reference
Land	-	9.1.1
Building / Infrastructure	738,312	9.1.2
Machinery & equipment	94,020,000	9.1.3
Office equipment	2,019,500	9.1.4

Furniture & fixtures	1,113,500	9.1.5
Office vehicles	1,913,000	9.1.6
Pre-operating costs	3,251,440	9.1.7
Security Against Building	900,000	9.1.8
Total Capital Cost - (A)	**103,955,752**	
Equipment spare part inventory	313,400	
Raw material inventory	10,886,400	
Upfront building rent	300,000	
Cash	3,000,000	
Total Working Capacity – (B)	**14,499,800**	
Total Project Cost - (A+B)	**118,455,552**	

9.1.1. Land

The proposed unit will be established on a rented land having an area of 4,950 square feet (22 Marla). Total rental cost has been estimated as PKR 300,000. The breakup of the space requirement is provided in Table 4.

Table 4: Breakup of Space Requirement

Production Area	Number	Length	Width	Area (Sq. Ft.)
Office Area	1	20	25	500
Reception Area	1	10	10	100
Staff Area	1	20	20	400
Production Hall	1	50	40	2,000
Store Room-Raw Material	1	25	25	625
Store Room-Finished Goods	1	20	20	400
R&D and Quality Assurance Lab	1	10	10	100
Show Room	1	10	10	100
Parking Area	1	20	20	400
Kitchen	1	10	10	100
Washrooms	6	6	6	225
Total Area				**4,950**

9.1.2. Building/ Infrastructure

There will be no cost of building construction since the metal injection molding technology will be started in a rented building having an area of 4,950 square feet. However, there will be a renovation cost required to make the building usable for the business. Building rent of PKR 300,000 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 278.37 KW for which an industrial electricity connection will be required. Table 5 provide details of building renovation cost.

Table 5: Building Renovation Cost

Cost Item	Unit of Measurement	Total Units	Cost/Unit (PKR)	Total Cost (PKR)
Paint Cost	Liter	121	800	96,804
Labour Cost	Sq.Feet	12,101	15	181,508
Tile Cost	Sq.Feet	1,225	120	147,000
Labour Cost-Tile	Sq.Feet	1,225	40	49,000
Curtain	Units	6	6,000	36,000
Blinds	Units	4	7,000	28,000
Decorations				200,000
Total (PKR)				**738,312**

9.1.3. Machinery and Equipment

Table 6 provides details of machinery and equipment for the proposed project.

Table 6: Machinery and Equipment Cost Details

Cost Item	Number of Items	Unit Cost (PKR)	Duties (PKR) (0%)	Taxes (PKR) (18%)	Freight Charges (PKR) (10%)	Installation Charges(PKR) (10%)	Total Cost (PKR)
Metal Injection Molding Machine (500 ton)	1	18,000,000	0	3,240,000	1,800,000	1,800,000	24,840,000
De-binding Furnace (450kg/20 hour)	1	23,000,000	0	4,140,000	2,300,000	2,300,000	31,740,000
Sintering Furnace (450kg/20 hour)	1	23,000,000	0	4,140,000	2,300,000	2,300,000	31,740,000
Generator (300KVA)	1	3,700,000					3,700,000
Molds	4	500,000					2,000,000
Total							**94,020,000**

9.1.4. Office Equipment

Table 7 shows details of equipment cost required for the metal injection molding technology.

Table 7: Office Equipment Cost Details

Cost Item	No.	Unit Cost (PKR)	Total Cost (PKR)
Air Conditioners	6	105,000	630,000
Laptop	4	150,000	600,000
Desktop Computer	5	75,000	375,000
Printer	2	51,500	103,000
Water Dispenser	2	20,000	40,000
Security System (6 Cams , 2 MP)	20	2,500	50,000
DVR	2	14,000	28,000
LED/LCD TV	1	36,000	36,000
WI-FI/ Internet Connection	1	3,500	3,500
Ceiling Fan	17	8,000	136,000
Exhaust Fan	4	4,500	18,000
Total Cost (PKR)			**2,019,500**

9.1.5. Furniture and Fixture

Table 8 provides details of furniture and fixtures.

Table 8: Furniture & Fixtures Cost Details

Cost Item	Number of Items	Unit Cost (PKR)	Total Cost (PKR)
Executive Table	1	60,000	60,000
Executive Chair	1	30,000	30,000
Staff Chairs	31	13,500	418,500
Staff Table	14	30,000	420,000
Visitor Chairs	5	15,000	75,000
Reception Counter	1	20,000	20,000
Sofa Set	2	45,000	90,000
Total Cost (PKR)			**1,113,500**

9.1.6. Vehicles

Table 9 provides details of the vehicles required along with their cost for the proposed project.

Table 9: Office Vehicle Cost Details

Cost Item	Number of Vehicles	Unit Cost (PKR)	Registration Fee Plus Number Plate Charges	Total (PKR)
Loader Rickshaw	1	250,000	13,000	263,000
Motorcycle	2	111,500	13,000	236,000
Suzuki Ravi	1	1,400,000	14,000	1,414,000
Total Cost (PKR)				**1,913,000**

9.1.7. Pre-Operating Costs

Table 10 provides details of estimated pre-operating costs.

Table 10: Pre-Operating Cost Details

Costs Item	No.	Hiring Months Beforein Year 0	Unit Cost (per month) (PKR)	Cost (PKR)
Production Supervisor	1	1	80,000	80,000
Injection Molding Operator	1	1	40,000	40,000
De-binding Furnace Operator	1	1	40,000	40,000
Sintering Furnace Operator	1	1	40,000	40,000
R&D Manager	1	1	100,000	100,000
Quality Checker	1	1	50,000	50,000
Procurment Officer	1	1	50,000	50,000
Office Boy	1	1	25,000	25,000
Security Guard	3	1	25,000	75,000
Sweeper	1	1	25,000	25,000
Utility expenses				2,726,440
Total Cost (PKR)				**3,251,440**

9.1.8. Security against Building

Table 11 provides details of estimated security against building.

Table 11: Security against Building

Particular	Months	Rent per month (PKR)	Total (PKR)
Security against building	3	300,000	900,000
Total (PKR)			**900,000**

9.2. Breakeven Analysis

Table 12 shows calculation of break-even analysis.

Table 12: Breakeven Analysis

Particulars	Amount First Year (PKR)	Profitability Ratio
Sales (PKR) – A	269,821,125	100%
Variable Cost (PKR) – B	214,618,652	80%
Contribution (PKR) (A-B) = C	55,202,473	20%
Fixed Cost (PKR) – D	24,233,809	9%
Contribution Margin	20%	
Breakeven Analysis		
Breakeven Revenue (PKR)		118,451,097
Break-Even (Parts)		896,084
Breakeven Capacity		26%

9.3. Revenue Generation

Table 13 provides details regarding revenue generation from metal injection molding technology during the first year of its operations.

Table 13: Revenue Details

Products	Number of Parts Sold @60%	Price per part (PKR)	Total Revenue (PKR)
Trigger components	299,801	140	41,972,175
Operating rods	199,868	130	25,982,775

Magazine release	299,801	140	41,972,175
Hammers	99,934	120	11,992,050
Triggers	299,801	140	41,972,175
Disassembly lever	199,868	130	25,982,775
Mounts, sights and housings	99,934	120	11,992,050
Bolts, handles, and stops	299,801	140	41,972,175
Safeties, hinges, and locks	199,868	130	25,982,775
Total (PKR)			**269,821,125**

9.4. Variable Cost Estimate

Variable costs of the project have been provided in Table 14.

Table 14: Variable Cost Estimate

Description of Costs	Amount (PKR)
Feedstock Cost	130,636,800
Nitrogen Gas for Furnace	2,100,000
Generator Fuel Cost	8,640,000
Direct Utilities Cost	31,124,702
Direct Labor	37,440,000
Machinery Maintenance Cost	1,880,400
Communications expense (phone, mail, internet, etc.)	1,092,000
Office vehicles running expense	612,750
Office expenses (stationery, entertainment etc.)	1,092,000
Total Variable Cost (PKR)	**214,618,652**

Table 15: Feedstock Cost

Cost Item	Average weight per finished part (grams)	No. of parts manufactured	Total weight of parts (kg)	Total weight of feedstock used (kg) (A)
Feedstock Cost	12	3,402,000	40,824	68,040
Feedstock Price (PKR/kg) (B)				3,200
Feedstock Cost @100% (PKR) (C= A*B)				217,728,000
Feedstock Cost 60% (PKR) (D=C*60%)				**130,636,800**

Table 16: Generator Fuel Cost

Machine	Diesel Consumption per Liter/Hour	Generator Usage Hours per Day	Total Diesel Consumption Liter/Day	Diesel Price per Liter	Total Diesel Consumption Liter/Day (PKR)	Total Diesel Consumption Liter/Year (PKR)
300kva Generator	50	3	150	240	36,000	8,640,000

Table 17: Direct Labor

Personnel	Number of Personnel	Salary per Head (PKR)	Annual Salaries (PKR)
Production Manager	3	200,000	7,200,000
Production Supervisor	3	80,000	2,880,000
Injection Molding Operator	6	40,000	2,880,000
De-binding Furnace Operator	6	40,000	2,880,000
Sintering Furnace	6	40,000	2,880,000
R&D Manager	3	100,000	3,600,000
R&D Officer	3	60,000	2,160,000
Quality Manager	3	80,000	2,880,000
Quality Checker	3	50,000	1,800,000
Procurment Officer	3	50,000	1,800,000
Store Incharge	12	45,000	6,480,000
Total (PKR)	**51**		**37,440,000**

Table 18: Vehicle Running Expenses

Particulars	Loader Rickshaw KM Per Year	Motorcycle KM Per Year	Suzuki Ravi KM Per Year	Loader Rickshaw	Motorcycle	Suzuki Ravi
Fuel cost	18,000	24,000	15,000	150,000	150,000	93,750
Mileage (KM)				30	40	40
Oil & Tuning Cost per Year (PKR)				9,000	20,000	20,000
Oil & Tuning KM				2,000	1,200	3,000
No of Vehicles				1	2	1
Yearly Cost				**159,000**	**340,000**	**113,750**

Table 19: Variable Cost Assumption

Description of Costs	Rational
Nitrogen Gas for Furnace	7,000 per day

Machinery Maintenance Cost	2% of Cost of Machinery
Commuication expense	20% of Management staff expense
Office expenses (stationery, entertainment, etc.)	20% of Management staff expense

9.5. Fixed Cost Estimate

Table 20 shows the estimated fixed cost of the project.

Table 20: Fixed Cost Estimate

Description of Costs	Amount (PKR)
Management Staff	5,460,000
Building rental expense	3,600,000
Indirect Utilities	1,592,578
Promotional expense	1,349,106
Depreciation expense	10,232,731
Amortization of pre-operating costs	650,288
Bad debt expense	1,349,106
Total Fixed Cost	**24,233,809**

Table 21: Management Staff

Personnel	Number of Personnel	Salary per Head (PKR)	Annual Salaries (PKR)
Receptionist	1	45,000	540,000
Admin and HR Officer	1	50,000	600,000
Sales & Marketing Officer	1	70,000	840,000
Accountant	1	40,000	480,000
Office Boy	2	25,000	600,000
Security Guard	6	25,000	1,800,000
Sweeper	2	25,000	600,000
Total	**14**		**5,460,000**

Table 22: Fixed Cost Assumptions

Description of Costs	Rational
Promotional expense	0.5% of revenue
Bad debt expense	0.5% of revenue
Depreciation	
Building & infrastructure	10% of cost
Machinery & equipment	10% of cost
Office equipment, Furniture & Fixture, Office vehicles	15% of cost

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 23.

Table 23: Financial Feasibility Analysis

Description	Project
IRR	42%
NPV (PKR)	121,425,256
Payback Period (years)	3.32
Projection Years	10
Discount rate used for NPV	25%

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 24.

Table 24: Financial Feasibility Analysis with 50% Debt

Description	Project
IRR	42%
NPV (PKR)	159,988,078
Payback Period (years)	3.30

Projection Years	10
Discount rate used for NPV	22%

9.8. Human Resource Requirement

The proposed services shall require the workforce as provided in Table 25.

Table 25: Human Resource

Personnel	Number of Personnel	Salary per Head (PKR)	Annual Salaries (PKR)
Production Manager	3	200,000	7,200,000
Production Supervisor	3	80,000	2,880,000
Injection Molding Operator	6	40,000	2,880,000
De-binding Furnace Operator	6	40,000	2,880,000
Sintering Furnace	6	40,000	2,880,000
R&D Manager	3	100,000	3,600,000
R&D Officer	3	60,000	2,160,000
Quality Manager	3	80,000	2,880,000
Quality Checker	3	50,000	1,800,000
Receptionist	1	45,000	540,000
Admin and HR Officer	1	50,000	600,000
Sales & Marketing Officer	1	70,000	840,000
Procurment Officer	3	50,000	1,800,000
Store Incharge	12	45,000	6,480,000
Accountant	1	40,000	480,000
Office Boy	2	25,000	600,000
Security Guard	6	25,000	1,800,000
Sweeper	2	25,000	600,000
Total	**65**		**42,900,000**

10. CONTACT DETAILS

The contact details of all the major suppliers of tools and equipment are given in Table 26.

Table 26: Contact Details

Name of Supplier	Products	Contact	Website/Email
Easy Fashion Metal Products Trade Co., Ltd.	De-binding Furnace	86-13467537752	www.advancedatomizer.com
Easy Fashion Metal Products Trade Co., Ltd.	Sintering Furnace	86-13467537752	www.advancedatomizer.com
Ningbo Bocheng Intelligent Equipment Co., Ltd.	Metal Injection Molding Machine	86-18067387221	www.sunbun-machine.com

11. USEFUL LINKS

Table 27: 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
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	http://www.balochistan.gov.pk/
Pakistan Automotive Manufacturers Association (PAMA)	https://www.pama.org.pk/
Pakistan Pharmaceutical Manufacturers Association (PPMA)	https://ppma.org.pk/
Association of Pakistan Motorcycle Assemblers (APMA)	www.motorcycleexport.com.
All Pakistan Textile Mills Association	https://aptma.org.pk/

12. ANNEXURES

12.1.Income Statement

Calculations

Income Statement **SMEDA**

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Revenue	**269,821,125**	**328,050,501**	**388,893,777**	**458,662,441**	**538,536,899**	**629,844,766**	**734,078,536**	**808,912,016**	**890,342,492**	**979,970,303**
Cost of sales										
Feedstock Cost	130,636,800	155,769,869	184,639,218	217,742,392	255,639,245	298,959,446	348,410,856	383,484,215	422,088,293	464,578,514
Nitrogen Gas for Furnace	2,100,000	2,311,400	2,544,081	2,800,185	3,082,070	3,392,332	3,733,827	4,109,699	4,523,408	4,978,765
Generator Fuel Cost	8,640,000	9,509,760	10,467,076	11,520,761	12,680,518	13,957,024	15,362,031	16,908,475	18,610,595	20,484,061
Direct Utilities Cost	31,124,702	33,937,337	37,004,142	40,348,082	43,994,204	47,969,814	52,304,686	57,031,286	62,185,013	67,804,466
Direct Labor	37,440,000	41,071,680	45,055,633	49,426,029	54,220,354	59,479,729	65,249,262	71,578,441	78,521,549	86,138,140
Machinery Maintenance Cost	1,880,400	2,069,694	2,278,043	2,507,366	2,759,774	3,037,591	3,343,375	3,679,942	4,050,389	4,458,128
Total cost of sales	211,821,902	244,669,740	281,988,192	324,344,816	372,376,166	426,795,935	488,404,036	536,792,057	589,979,248	648,442,074
Gross Profit	57,999,223	83,380,761	106,905,585	134,317,625	166,160,733	203,048,831	245,674,499	272,119,959	300,363,244	331,528,229
General administration & selling expenses										
Management Staff	5,460,000	5,989,620	6,570,613	7,207,963	7,907,135	8,674,127	9,515,517	10,438,523	11,451,059	12,561,812
Building rental expense	3,600,000	3,960,000	4,356,000	4,791,600	5,270,760	5,797,836	6,377,620	7,015,382	7,716,920	8,488,612
Indirect Utilities	1,592,578	1,736,494	1,893,415	2,064,517	2,251,080	2,454,503	2,676,308	2,918,157	3,181,861	3,469,396
Communications expense (phone, mail, internet, etc.)	1,092,000	1,197,924	1,314,123	1,441,593	1,581,427	1,734,825	1,903,103	2,087,705	2,290,212	2,512,362
Office vehicles running expense	612,750	674,434	742,326	817,054	899,304	989,834	1,089,477	1,199,151	1,319,866	1,452,732
Office expenses (stationery, entertainment etc.)	1,092,000	1,197,924	1,314,123	1,441,593	1,581,427	1,734,825	1,903,103	2,087,705	2,290,212	2,512,362
Promotional expense	1,349,106	1,640,253	1,944,469	2,293,312	2,692,684	3,149,224	3,670,393	4,044,560	4,451,712	4,899,852
Depreciation expense	10,232,731	10,232,731	10,232,731	10,232,731	10,232,731	10,232,731	9,980,431	10,803,871	10,803,871	10,803,871
Amortization of pre-operating costs	650,288	650,288	650,288	650,288	650,288	-	-	-	-	-
Bad debt expense	1,349,106	1,640,253	1,944,469	2,293,312	2,692,684	3,149,224	3,670,393	4,044,560	4,451,712	4,899,852
Subtotal	27,030,559	28,919,920	30,962,557	33,233,962	35,759,522	37,917,130	40,786,346	44,639,613	47,957,426	51,600,851
Operating Income	30,968,665	54,460,842	75,943,028	101,083,663	130,401,211	165,131,701	204,888,153	227,480,345	252,405,818	279,927,378
Other income 2										
Gain / (loss) on sale of machinery & equipment	-	-	-	-	-	-	-	-	-	
Gain / (loss) on sale of office equipment	-	-	-	-	-	-	504,875	-	-	
Gain / (loss) on sale of office vehicles	-	-	-	-	-	-	478,250	-	-	
Earnings Before Interest & Taxes	30,968,665	54,460,842	75,943,028	101,083,663	130,401,211	165,131,701	205,871,278	227,480,345	252,405,818	279,927,378
Subtotal	-	-	-	-	-	-	-	-	-	-
Earnings Before Tax	30,968,665	54,460,842	75,943,028	101,083,663	130,401,211	165,131,701	205,871,278	227,480,345	252,405,818	279,927,378
Tax	13,609,816	22,981,295	30,500,060	39,299,282	49,560,424	61,716,095	75,974,947	83,538,121	92,262,036	101,894,582
NET PROFIT/(LOSS) AFTER TAX	**17,358,849**	**31,479,547**	**45,442,968**	**61,784,381**	**80,840,787**	**103,415,605**	**129,896,331**	**143,942,225**	**160,143,782**	**178,032,796**

12.2.Balance Sheet

Calculations **SMEDA**

Balance Sheet

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Assets											
Current assets											
Cash & Bank	3,000,000	7,865,863	23,675,980	39,531,091	55,482,310	71,575,765	87,295,297	97,098,700	111,280,127	121,493,098	227,502,757
Accounts receivable	-	8,994,038	10,935,017	12,963,126	15,288,748	17,951,230	20,994,826	24,469,285	26,963,734	29,678,083	32,665,677
Equipment spare part inventory	313,400	377,949	455,793	549,670	662,882	799,411	964,061	1,162,623	1,402,081	1,690,859	-
Raw material inventory	10,886,400	14,287,559	18,640,362	24,195,198	31,265,799	40,244,831	51,623,247	62,539,866	75,764,991	91,786,794	-
Finished goods inventory		4,412,956	5,097,286	5,874,754	6,757,184	7,757,837	8,891,582	10,175,084	11,183,168	12,291,234	13,509,210
Pre-paid building rent	300,000	330,000	363,000	399,300	439,230	483,153	531,468	584,615	643,077	707,384	-
Total Current Assets	14,499,800	36,268,364	59,167,437	83,513,139	109,896,153	138,812,227	170,300,481	196,030,173	227,237,177	257,647,453	273,677,644
Fixed assets											
Land	-	-	-	-	-	-	-	-	-	-	-
Building Infrastructure Renovation	738,312	664,480	590,649	516,818	442,987	369,156	295,325	221,493	147,662	73,831	-
Machinery & equipment	94,020,000	84,618,000	75,216,000	65,814,000	56,412,000	47,010,000	37,608,000	28,206,000	18,804,000	9,402,000	-
Furniture & fixtures	1,113,500	946,475	779,450	612,425	445,400	278,375	111,350	2,110,762	1,794,148	1,477,534	1,160,919
Office vehicles	1,913,000	1,626,050	1,339,100	1,052,150	765,200	478,250	191,300	2,914,651	2,477,454	2,040,256	1,603,058
Office equipment	2,019,500	1,716,575	1,413,650	1,110,725	807,800	504,875	201,950	3,828,186	3,253,958	2,679,730	2,105,502
Security against building	900,000	900,000	900,000	900,000	900,000	900,000	900,000	900,000	900,000	900,000	900,000
Total Fixed Assets	100,704,312	90,471,580	80,238,849	70,006,118	59,773,387	49,540,656	39,307,925	38,181,093	27,377,222	16,573,351	5,769,480
Intangible assets											
Pre-operation costs	3,251,440	2,601,152	1,950,864	1,300,576	650,288	-	-	-	-	-	-
Total Intangible Assets	3,251,440	2,601,152	1,950,864	1,300,576	650,288	-	-	-	-	-	-
TOTAL ASSETS	**118,455,552**	**129,341,097**	**141,357,150**	**154,819,833**	**170,319,828**	**188,352,883**	**209,608,405**	**234,211,266**	**254,614,398**	**274,220,804**	**279,447,123**
Liabilities & Shareholders' Equity											
Current liabilities											
Accounts payable		2,206,121	2,822,113	3,603,055	4,591,473	5,840,535	7,416,653	8,939,449	10,779,602	13,003,739	594,417
Total Current Liabilities	-	2,206,121	2,822,113	3,603,055	4,591,473	5,840,535	7,416,653	8,939,449	10,779,602	13,003,739	594,417
Other liabilities											
Shareholders' equity											
Paid-up capital	118,455,552	118,455,552	118,455,552	118,455,552	118,455,552	118,455,552	118,455,552	118,455,552	118,455,552	118,455,552	118,455,552
Retained earnings		8,679,424	20,079,486	32,761,227	47,272,804	64,056,796	83,736,201	106,816,266	125,379,245	142,761,513	160,397,155
Total Equity	118,455,552	127,134,976	138,535,037	151,216,778	165,728,355	182,512,347	202,191,752	225,271,817	243,834,797	261,217,065	278,852,706
TOTAL CAPITAL AND LIABILITIES	**118,455,552**	**129,341,097**	**141,357,150**	**154,819,833**	**170,319,828**	**188,352,883**	**209,608,405**	**234,211,266**	**254,614,398**	**274,220,804**	**279,447,123**

12.3.Cash Flow Statement

Calculations **SMEDA**

Cash Flow Statement

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Operating activities											
Net profit		17,358,849	31,479,547	45,442,968	61,784,381	80,840,787	103,415,605	129,896,331	143,942,225	160,143,782	178,032,796
Add: depreciation expense		10,232,731	10,232,731	10,232,731	10,232,731	10,232,731	10,232,731	9,980,431	10,803,871	10,803,871	10,803,871
amortization of pre-operating costs		650,288	650,288	650,288	650,288	650,288	-	-	-	-	-
Accounts receivable		(8,994,038)	(1,940,979)	(2,028,109)	(2,325,622)	(2,662,482)	(3,043,596)	(3,474,459)	(2,494,449)	(2,714,349)	(2,987,594)
Finished goods inventory		(4,412,956)	(684,330)	(777,468)	(882,430)	(1,000,653)	(1,133,745)	(1,283,502)	(1,008,084)	(1,108,066)	(1,217,976)
Equipment inventory	(313,400)	(64,549)	(77,844)	(93,877)	(113,212)	(136,530)	(164,650)	(198,562)	(239,458)	(288,778)	1,690,859
Raw Material Iventory	(10,886,400)	(3,401,159)	(4,352,803)	(5,554,837)	(7,070,601)	(8,979,031)	(11,378,416)	(10,916,619)	(13,225,125)	(16,021,804)	91,786,794
Pre-paid building rent	(300,000)	(30,000)	(33,000)	(36,300)	(39,930)	(43,923)	(48,315)	(53,147)	(58,462)	(64,308)	707,384
Accounts payable		2,206,121	615,992	780,942	988,418	1,249,063	1,576,118	1,522,795	1,840,153	2,224,137	(12,409,322)
Cash provided by operations	(11,499,800)	13,545,287	35,889,602	48,616,338	63,224,023	80,150,250	99,455,732	125,473,269	139,560,671	152,974,485	266,406,813
Financing activities											
Issuance of shares	118,455,552	-	-	-	-	-	-	-	-	-	-
Purchase of (treasury) shares											
Cash provided by / (used for) financing activities	118,455,552	-	-	-	-	-	-	-	-	-	-
Investing activities											
Capital expenditure	(103,955,752)	-	-	-	-	-	-	(8,853,599)	-	-	-
Acquisitions											
Cash (used for) / provided by investing activities	(103,955,752)	-	-	-	-	-	-	(8,853,599)	-	-	-
NET CASH	3,000,000	13,545,287	35,889,602	48,616,338	63,224,023	80,150,250	99,455,732	116,619,669	139,560,671	152,974,485	266,406,813

13. KEY ASSUMPTIONS

13.1. Operating Cost Assumptions

Table 28: Operating Cost Assumptions

Description	Details
Operating costs growth rate	10.1%
Electricity growth rate	9.0%
Water price growth rate	9.0%
Gas price growth rate	9.0%
Wage growth rate	9.7%
Office equipment price growth rate	9.6%
Office vehicles price growth rate	6.2%

13.2. Revenue Assumptions

Table 29: Revenue Assumptions

Description	Details
Sale price growth rate	10.1%
Capacity utilization	60%
Capacity utilization growth rate	5%
Maximum capacity	90%

13.3. Financial Assumptions

Table 30: Financial Assumptions

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

13.4. Debt Related Assumptions

Table 31: Debt Related Assumption

Description of Cost	Details
Project Life (Years)	10

Debt: Equity	50:50
Discount Rate	22%
Debt Grace Period	1 Years
Interest Rate (KIBOR+3%)	19%

13.5.Cash Flow Assumptions

Table 32: Cash Flow Assumptions

Description	Details
Accounts receivable cycle (in days)	10
Accounts payable cycle (in days)	40

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