Pre-feasibility Study

INJECTION MOLDING PLASTIC PRODUCTS

June 2022

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

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1 PROJECT PROFILE

1.1 Purpose of the Documents

This document is developed to provide the Investor with potential investment opportunity in setting up and operating an Injection Molding Plastic Plant that manufactures a variety of household items. This pre-feasibility gives insight into various aspects of an injection molding setup including both technical and general information. The document is designed to provide relevant details to facilitate the Investor in making the decision by providing various technological as well as business alternatives. The document also allows flexibility to change various project parameters to suit the needs of the Investor.

1.2 Project Brief

Plastic is a common name for Polymers: materials made of long strings of carbon and other elements. Each unit in a string is called a monomer, and is a chemical usually derived from oil. There are many different types of plastic, depending on the starting monomer selected, the length of polymer chains, and the type of modifying compounds added. Each plastic is developed for a special purpose. However the varied use of plastic in our everyday life has made it an integral component in almost everything. Plastic is used in everyday items like ballpoint pen, buckets, cups, glasses, water pipes, plastic bags to items of engineering excellence like cars and airplanes. According to some experts, around 250 kilograms plastic is used in every car manufactured in Europe. With such a high ratio of usage in developed countries, plastic has become a cheap but an important commodity

1.3 Opportunity Rationale

The manufacturing of household durables through the plastic injection and molding business is a viable business provided that it is operated with a good business acumen that involves having a thorough knowledge and experience of the product range, technical requirements, operational procedures and also managing the jobs with the right type of technical manpower. When these factors combine with good and effective business development skills, the business is expected to give considerable profits which are expected to grow over the years.

1.3.1 Properties of Plastics

The numerous properties of plastics have made it possible to virtually make every product conceivable. Some properties of plastic that distinguishes them from other materials are:

- Attractive
- Hard
- Soft and rubbery
- Easy to clean
- Flexible

- Good insulators of heat or electricity
- Light weight
- Hygienic
- Easy to shape and color
- Economical

Apart from some of the properties of plastics mentioned above, one important feature of plastic is that it is a non-rusting material which makes it a very usable commodity especially in coastal areas where there is a lot of humidity.

As stated earlier, the use of plastics is increasing all the time as they replace materials such as metal, wood, paper, ceramics and glass in a wide variety of uses. More over the overall demand and local supply gap that prevails in the market remains largely unmet which also provides opportunities for entering in to this business.

The following table gives an overview of some of the applications of plastics

POLYMER	PROPERTIES	TYPICAL APPLICATIONS
ABS	Toughness, Electroplatable	Home appliances, TV and computer parts, etc
POM	Low friction, low wear. Little change in impact strength with temp. Resistance to fatigue, free from biological attack but susceptible to UV radiation.	Bearing applications, gears, digit wheels, sprocket, chain, cams, carburetor body, aerosol parts etc.
PMMA	Excellent clarity & mp; transparency Dimensionally rigid, Resistant to outdoor weathering.	Lamp covers, lenses, reflectors knobs, transparent panel knobs, covers.
PPO	Excellent electrical properties flame resistant, good toughness, dimensionally rigid, resistant to detergent.	Electrical parts, TV back covers, car dashboards, and washing machine parts.
PA	Wear resistant, tough, low friction, low fatigue, withstand temp. Electrical insulation property.	Bearings, gears, electrical socket plug, cooling fan, power tool housing, safety belt parts, bathroom fittings, etc.
PC	High impact strength, excellent clarity, good dimensional stability good weathering resistant, low moisture absorption, high heat deflection temperature.	Replacement for glass, Transparent covers for instrument panel, lighting application, safety helmet, car lamp housing, goggles, lenses, food mixer parts, computer parts, connectors.
PES	Lower flammability, excellent electrical properties, excellent long term load bearing	Aircraft parts, electrical parts, automobile parts, microwave, dishes,

POLYMER	PROPERTIES	TYPICAL APPLICATIONS
	properties at elevated temperature, good toughness.	grills, dishwasher parts, hair drier parts, projector fan.
PBT	High rigidity, ultra-low water absorption, excellent electrical properties, withstands high temperature under load.	Electrical components, lamp housing, fuse cases, pump housing, toaster parts, and hairdryer parts.
PPS	Excellent electrical properties, arc resistant, withstand high temperature. good dimensional stability,	Connectors, terminal blocks, socket, coil former, relay parts, lamp holder, switches, carburetor parts, ignition plate.
PETP	High stiffness, excellent dimensional stability at elevated temperature, good electrical properties.	Rotary switches, contactors, circuit boards.
PP- Co polymer	High impact strength, Improved heat stability,	Luggage, housewares, toys, interior parts of car, washing m/c parts, bottle caps, disposable syringe, crates, battery boxes, bobbins, dyeing cones.
PEEK	Excellent long term bearing properties at high temperature of 200 degree C., strong, rigid, tough, excellent abrasion resistant.	Wire coating, parts for aerospace application.
SAN	Excellent optical properties, tough, no weather resistant,	Cup, picnic items, tray, cutlery, cassette storage racks, dials, cosmetics containers,
TPU	Flexible, durable, oil resistant.	Seal, washers, rollers, watch straps, shoes soles.

Some most common applications of commodity plastics in our everyday life are:

APPLICATION OF COMMODITY PLASTICS		
HDPE	High Density Polyethylene	Bottle crates, containers, house ware
LDPE	Low Density Polyethylene	Toys, bottle caps, lids, bowls, shopping bags
PS	Polystyrene	Toys, containers, tape cassettes, disposable cups, transistor cabinet, appliance housing

CA	Cellulose Acetate	Toys, pen, handles for tools
RPVC	Rigid Polyvinyl Chloride	Pipe fittings, guttering, plumbing items
SPVC	Soft Polyvinyl Chloride	Washers, soft tubes, soles, heels, footwear

1.4 Plastic Industry & Market Overview

The per capita consumption of plastic in Pakistan is 7.5[1] kilograms, while this is 10.7 kg in India and 55 kg in China and 100kg in developed countries. The highest per capita consumption of plastic is in United States and Germany, where per capita consumption is 139 kg per annum. Globally, the per capita plastic consumption works out to be average around 43 kg per annum. The consumption of plastic is less in Pakistan as the local industries are not developing as rapidly as they are growing in the other parts of the world.

1.4.1 Market Players

There are some 11000+[2] plastic manufacturers in the country and 500,000 people are directly and indirectly engaged with this business. The plastic industry falls in cottage industry and there are some manufacturers, who are medium-sized industries.

1.4.2 Consumption & Imports

Pakistan imports 80-90 percent raw material for plastic making from different countries, and at present there is only one company producing raw material for the industry. Currently Pakistan top producing company is captured 75%[3] of market share among other companies 200 kg tons raw material produced last year.

Pakistan's economy achieved an impressive GDP growth rate during the last three decades. Pakistan's plastic industry is thriving at an average annual growth rate of 15% with a total estimated production capacity of 745,000 M/T per annum and raw material production is around 610,000 Metric Tons per annum[4]. The country imports 70 percent raw material from UAE and Far Eastern countries. The special grade raw material is imported from China and USA, which is 20 percent of total raw material consumption.

[1] Punjab Board Of Investment

[2] Pakistan Plastic Manufacturers Association

[3] Economic Survey of Pakistan

[4] Ministry of Information and Broadcasting, Government of Pakistan

Moreover, the recent penetration of cheap Chinese products into Pakistan has made the competitive situation in the local plastic industry very intense. Local manufacturers have to import raw material which is a substantive cost of their total produce while Chinese products offering a large variety at affordable rates have made survival difficult for the local industry.

However many plastic manufacturers still enjoy good business since they are able to anticipate and understand the market dynamics that helps them to relate to the demand supply gap quickly than the rest of the producers. Some critical success factors are discussed below that need to be considered for the successful operation / viability of the business.

1.5 Key Success Factors/Practical Tips for Success

The three main critical success factors that affect the decision to invest in the proposed business setup are:

i) Related Experience

The Investor must have considerable experience of the plastic industry wherein he / should be able to identify the changing environment both at the demand and the supply side and react accordingly. Molds are very expensive; therefore the Investor needs to choose molds only for those products for which demand is expected to rise in the future.

Related industry experience is also required where purchase of raw material is being considered. Prices of HDPE / PP plastic resins are directly related to petroleum prices which are very dynamic.

ii) Marketing Skill

Another critical factor is that the Investor must have effective PR & marketing skills. These marketing skills will enable the Investor to carryout business development activities to target his potential customers and also to maintain his existing client base. Contacts with relevant distributors and major wholesale / retail outlets and markets play a crucial role in business development.

iii) Toll Manufacturing / Contract Manufacturing

Considering the price competition and the possibility of decreasing margins at retail level, many plastic good manufacturers have adhered to toll manufacturing where they are subcontracted by large companies to manufacture product parts like refrigerator parts, AC vents, grills etc. Although the margins received initially might not be significant but the volume of business is considerably large which makes up for the low margins. The margins tend to be very significant if the manufacturer possesses an expensive mold which is not available quite easily in the market. A strong referral base needs to be established in order to get such contracts.

1.6 Proposed Business Legal Status

Although the legal status of business tends to play an important role in any setup, the proposed plastic good manufacturing business is assumed to operate on a sole proprietorship basis which may extend to partnership in case of addition of new products that might add significant business to the existing setup.

1.7 Project Investment

This section will provide the total cost of the project.

Capital Investment	Rs. in actuals
Building/Infrastructure (Rent Advance)	1,980,000
Machinery & equipment	18,150,000
Furniture & fixtures	325,000
Office equipment	344,000
Pre-operating costs	400,000
Total Capital Costs	**21,199,000**
Working Capital	**Rs. in actuals**
Equipment spare part inventory	30,797
Raw material inventory	2,500,508
Upfront building rent	1,980,000
Upfront insurance payment	907,500
Cash	500,000
Total Working Capital	**5,918,805**
Total Project Cost	**27,117,805**

1.8 Proposed Product Mix

The proposed project is assumed to manufacture the following items using HDPE / Co - PP (Yuplene) plastic – Injection Grade:

- Water Buckets
- Buckets Handle
- Wash Tubs

According to this feasibility is assumed that these two products running in the production line, but initially the Investor, needs to be careful in choosing the product mix of the right type and size that has the greatest acceptability such that the sales volume generated is able to cover the mold costs required for each separate item. Considering this factor, it is proposed

that the Investor produces plastic goods for the above mentioned product categories with the following details:

ITEM	SIZE	COLOR VARIANT
Water Buckets	• 20 liters • 24 liters	• Blue & Red • Blue & Red
Bucket Handles	• 16 liters • 20 liters	• Blue & Red • Blue & Red
Wash Tubs	• 24 liters • 30 liters	• Blue & Red • Blue & Red

It is proposed that water colors be used for blue and red shades which give a translucent look to the product and are the most preferred option for the consumers.

One important factor to consider here is that the Investor must have the requisite skills to decide on whether to introduce a new product or add a new size to the existing product both of which require the purchase of an additional mold. Hence the experience of the Investor will play an important role in determining the course of action.

1.9 Recommended Project Parameters

Yearly Capacity	Human Resource	Equipment	Location
75% Capacity Utlization	Management Staff (6) Techincial Staff (9)	Japan/USA	Industrial Area

Financial Summary			
Project Cost	**IRR**	**NPV**	**Payback Period**
27,117,805	24%	Rs. 71,466,732	4.48 Years

1.10 Proposed Location

The recommended area for the proposed business setup will be in an Industrial Area. The main reason for such a location is dependent on the availability of all provisions necessary for the production process.

2 MACHINERY & EQUIPMENT

Injection molding is a method to obtain molded products by injecting plastic materials molten by heat into a mold, and then cooling and solidifying them. The method is suitable for the mass production of products with complicated shapes, and takes a large part in the area of plastic processing.

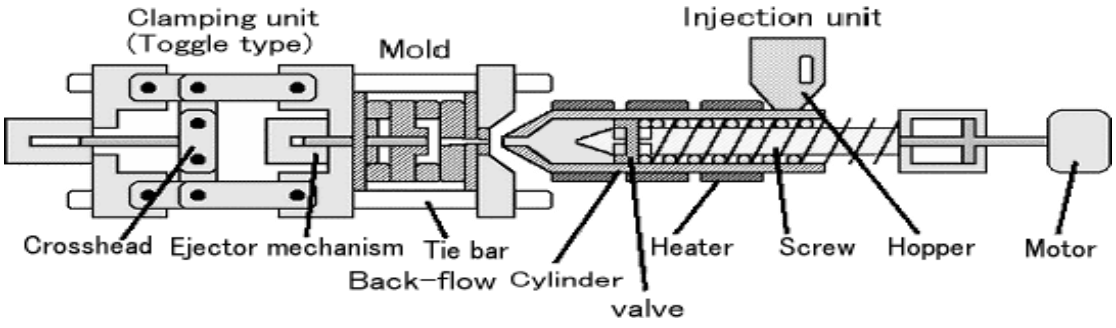
A typical injection molding machine is divided into 2 units i.e. a clamping unit and an injection unit.

- *Clamping Unit:* The functions of the clamping unit are opening and closing the die, and the ejection of products. There are 2 types of clamping methods, namely the toggle type shown in the figure below and the straight-hydraulic type in which a mold is directly opened and closed with a hydraulic cylinder.

- *Injection Unit:* The functions of the injection unit are to melt plastic by heat and then to inject molten plastic into a mold. The screw is rotated to melt plastic introduced from the hopper and to accumulate molten plastic in front of the screw (called metering). After the required amount of molten plastic is accumulated, injection process is stared. While molten plastic is flowing in a mold, the machine controls the moving speed of the screw, or injection speed. On the other hand, it controls dwell pressure after molten plastic fills out cavities. The position of change from speed control to pressure control is set at the point where either screws position or injection pressure reaches a certain fixed value.

It is however important to note that all flow speeds, injection speed, shot lead time, screw rotation speed and other particulars need to be controlled by the machinery operator. The Investor may also appreciate that the time allowed for the plastic to cool down also has an effect on the end product properties which requires considerable know-how and skilled handling of production line processes.

The diagram on the following page gives a cross-sectional view of the injection molding machine (note: this is just a theoretical representative diagram for the injection molding machine, as machines may vary according to their makes, brands, products produced etc.).



2.1 Tips for Purchasing a Mold

The mold is the most expensive component requiring considerable investment which is sometimes higher than the cost of the machinery itself. Therefore as discussed earlier, the molds need to be carefully chosen based on product acceptance production ease. Some of the following points should be considered when selecting the mold:

- **Cavity Size** of the injection molding machine is the major factor when deciding on the mold. The larger the cavity capacity the greater the adjustability of large sized molds for large products. For example an injection mold machine with 75 ounce cavity capacity cannot accommodate a 100 ounce mold. It is preferred that the mold should be at least 10 ounce less than the cavity size.
- **Mold Area & Structure** is another important factor to consider since it is not necessary that the mold size fits in the cavity as the dimensions of the mold also need to be in congruence with the cavity dimensions. The length width and depth of the mold needs to be in line with the cavity dimensions.
- **Tie Bars** are the strongholds that firmly grip the mold such that it remains unmoved during the impact. The distance between the tie bars which holds the mold and their relative properties need to be considered in order to avoid mismatch and errors during the injection molding process.
- **Mold Opening Space** is the space required by the ejector mechanism to eject the product, in case the mold opening space is smaller than the mold, the ejector will not be able to eject the cooled product within the available space.

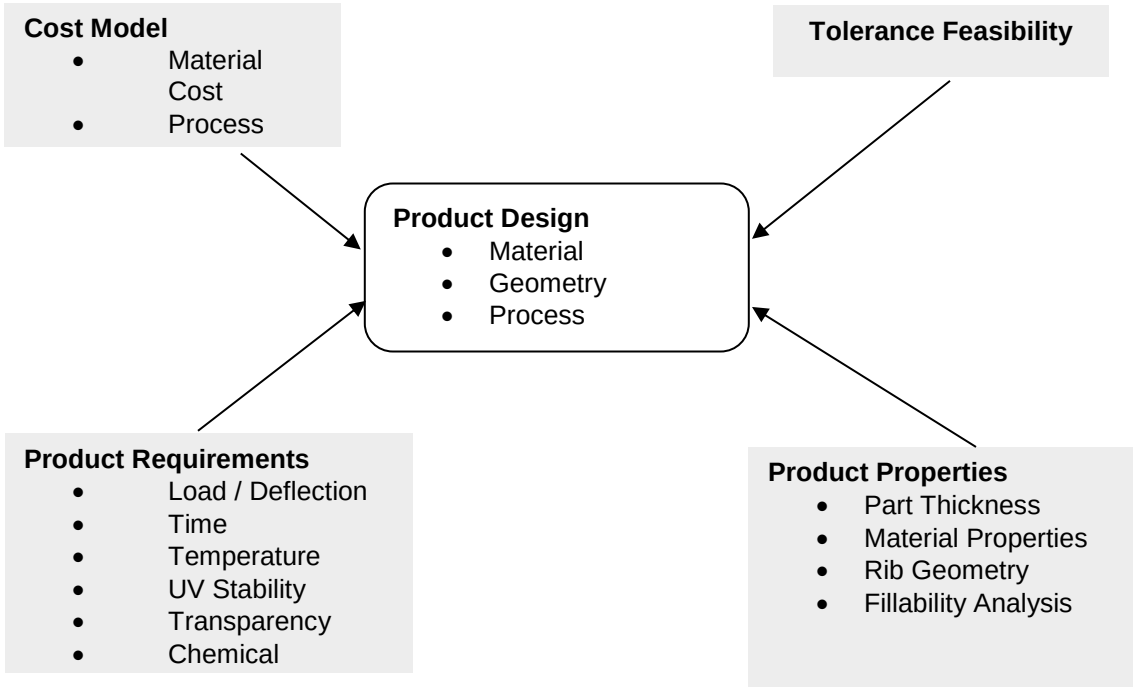
3 PROCESS FLOW

Injection molding is a powerful and comprehensive manufacturing process. However, it can also be a complicated and costly experience. The Investor and the product designer must not only consider part performance requirements, but process and material constraints as well as well as market accessibility. Effective management of these constraints in a time efficient manner can yield significant product cost savings and a quick time-to-market.

Much savings can be realized by making informed decisions early in the product design process. The product designer should have several tools and forms of knowledge at his disposal. In the early stages of design, and throughout much of the design process, the designer can employ qualitative knowledge in the form of personal experience and tabulated rules of thumb. Hence a brief overview of what things to consider while developing the product requires to be deliberated upon.

3.1 Product Design & Basics

Of critical importance to a good product design practice is the product under consideration which directly impacts on the raw material and the features of the molds to be used. The following schematic diagram depicts some of the basic requirements:



Based on the above product requirements the molds are to be carefully chosen since they are the most costly component of the Injection Molding Machine.

The geometric variable has the largest impact on mechanical performance of the product, of which wall thickness is the most critical. Since wall thickness is so strongly coupled with process ability, any design technique must also consider material and process constraints on wall thickness configuration. There are a number of factors that influence the choice of wall thickness, including:

- Mechanical Requirements: Nominal wall thickness must meet basic part requirements such as static, dynamic, and impact loading.

- Material and Process: Higher-flow materials will permit thinner wall designs, while thinner wall designs will in general require higher injection pressures.

- Production rate: Thicker parts will require longer cooling times and increase the cycle time.

- Part Geometry: Assembly and functional surface protrusions will require variations in the nominal wall. These may cause uneven cooling, part distortion, and residual stresses.

- Agency Requirements: Electrical and flammability considerations place certain restrictions on part thickness.

From a design perspective, the part mechanical performance will place certain (and very important) restrictions on wall thickness and part geometry. In many engineering applications, such mechanical performance concerns include strength & stiffness, impact strength, fatigue, and creep and stress relaxation. Good engineering practice suggests that the designer optimize the material, geometry, and process design to meet the mechanical, process, and production constraints to the extent possible. However, these parameters and technical details must be finalized and decided by the product designer (engineer) and machine operators. The use of computers in Computer Aided Designing (CAD) and Computer Aided manufacturing (CAM) has made it easy for the product designers to reach optimal and best suited solutions before starting the manufacturing process.

3.2 Production Process

The theory of injection molding can be reduced to four simple individual steps: Plasticizing, Injection, Chilling, and Ejection. Each of those steps is distinct from the others and correct control of each is essential to the success of the total process.

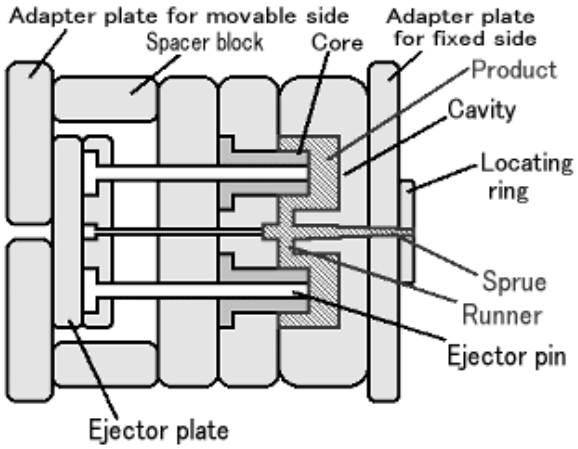
i. Plasticizing - describes the conversion of the polymer material from its normal hard granular form at room temperatures, to the liquid consistency necessary for injection at its correct melt temperature.
ii. Injection - is the stage during which this melt is introduced into a mold to completely fill a cavity or cavities.
iii. Chilling - is the action of removing heat from the melt to convert it from a liquid consistency back to its original rigid state. As the material cools, it also shrinks.
iv. Ejection - is the removal of the cooled, molded part from the mold cavity and from any cores or inserts.

3.3 Process Description

The solid polymers are added into the injection unit by way of the hopper, which are then crushed by a motor propelled screw in a heated cylinder, the molten polymer on reaching the desired temperature levels is introduced into the mold through a pressure valve (at the desired pressure level). The molten plastic then fills the cavities inside the mold until the core is completely filled. Once completely filled, the plastic is allowed to cool down at the desired temperature for a certain time period (this also affects the plastic properties). After

cooling, the plastic product is ejected out of the mold through ejection pins operating from an ejection plate placed behind the mold.

A mold is a hollow metal block into which molten plastic is injected to form a certain fixed shape. Although they are not illustrated in the figure shown above, actually there are many holes drilled in the block for temperature control by means of hot water, oil or heaters. Molten plastic flows into a mold through an aperture and fills cavities by way of runners and gates. Then, the mold is opened after cooling process and the ejector rod of the injection molding machine pushes the ejector plate of the mold to further eject moldings. The following diagram gives a common illustration of a mold:



3.4 Color Pigmentation

Attractive plastic products are key elements that appeal to the customer, since similar products vary nominally amongst various manufacturers. Usually the production manager decides on the color in consultation with the owner and then develops the pigment mix in terms of quantity and quality to meet the desired color schemes. The color pigments are then bought from the market and added to the plastic resins which are then churned in the coloring machine. Once the resins are colored according to the desired intensity, they are dried and cooled before being subsequently poured into the injection molding machine.

3.5 Raw Material Requirement

The raw materials required for the manufacturing of plastic goods are Injection Grade HDPE / PP Plastic resins. These plastic resins are usually bought as Co-Propylene Polymers (Yuplene). The main supplier of this plastic resin is SK CHEM., which has considerable presence in the Pakistani Market and is easily available. Moreover the color pigments are also easily available from the local market according to the color mix as desired by the manufacturer. There are recycled plastic resins available in the market and one has to be careful to check the plastic resins to ensure that they are not recycled since they diminish product quality and outlook.

3.6 Production Capacity

The production capacity for each of the machines depends on two main things

- Cooling Cycle Time
- Raw Material Injection Weight

Based on the above two factors and keeping in view the products to be produced, the yearly production output (based on 70% capacity utilization)for the proposed project will be as follows:

ITEM	SIZE	UNITS
Water Buckets	20 Liters 24 Liters	6,240 6,240
Buckets Handle	20 Liters 24 Liters	9,984 9,984
Water Tub	24 Liters 30 Liters	6,240 4,160

The production of the two types of water buckets is assumed to be based on a rotating cycle of six months. The cost of deploying a single machine for a single product becomes very high; therefore a single machine would be used to produce the two sizes of water buckets. (Please see Revenue and Cost Sheet for details).

Apart from the above production schedule, it is suggested that at least two machines be deployed for toll manufacturing purposes on which the margins tend to be relatively higher. Such contract manufacturing orders can be easily secured for various commodities like AC grills, road posts, and plastic containers for various FMCG products, automobile parts etc. For costing purposes, it is assumed that the two machines would be producing products requiring a shot weight of 500 grams and 1,000 grams respectively. The size and shape of the mold would depend on the product. (Please see Revenue and Cost Sheet for details).

4 LAND & BUILDING REQUIREMENT

4.1 Land Requirement

The land requirement is around 5,000 sq. feet in an industrial area where all utilities and facilities are properly available. The Building will easily allow the accommodation of the recommended machines and also allow space for further expansion in future, if required. The Building will also allow ample spaces for the raw material and finished good warehouses and a proper office building.

4.2 Covered Area Requirement

The proposed setup is assumed to be totally covered with around 100% of the total area of the building to work. It is recommended that the office and warehouses be made on the production hall to allow maximum utilization of space. It is also suggested that minimum space be utilized for office to allow maximum space available for storage of raw materials and finished goods inventory. The allocation of space would be as follows:

DETAILS	SIZE (SQ. FEET)	TOTAL CONSTRUCTION COST (RS)
Production Hall	4000	4,000,000
Warehouse	1,000	1,500,000
Total	**5000**	**5,500,000**

4.3 Recommended Mode

The proposed premises will be acquired on 06 month upfront rental deposit. For this Prefeasibility, rental for this size of space is assumed to be Rs. 165,000/- per month.

4.4 Office Furniture & Equipment

A total of Rs 325,000 is required for purchase of office furniture and related equipment. The following table gives an assumed breakup:

OFFICE FURNITURE		
ITEM	**NUMBER**	**ESTIMATED COST (RS.)**
Table & Chair Set (Owner)	1	25,000
Table & Chair Set (Office Staff)	5	75,000
Air Conditioner (Split Unit)	2	150,000
Waiting Chairs	5	35,000
Sofa Set for Customers	1	40,000
Total	**11**	**325,000**

The Office Furniture & Equipment will be depreciated at the rate of 10% per annum according to the diminishing balance method for the projected period.

5 MACHINERY & EQUIPMENT

Based on the number and type of products to be produced by the proposed injection molding setup, the following used/ refurbished machinery and molds will be required:

Item	Machine	Price Rs.
Water Buckets Details: 150 Ton Origin USA Make: CINCINNATI	A	4,400,000
Bucket Handles Details:120 Ton Origin Japan Make: KAWAGUCHI	B	4,500,000
Wash Tubs Details:365 Ton Origin Japan Make: KAWAGUCHI	C	5,000,000

Mold	Price Rs.	Total Rs.
1) 20 Liters 2) 24 Liters	350,000 375,000	725,000
3) Bucket handle	150,000	150,000
4) 24 Liters 5) 30 Liters	375,000 400,000	775,000

The above table gives the details of the machinery and molds required along with their cost for each commodity to be produced. These molds are locally available and can be customized according to the customer requirements. Apart from bucket handle, every other product requires a separate mold which corresponds with the size of the product; hence it has a direct impact on the cost of the machine and mold according to the product size.

5.1 Injection Molding Machine

The injection molding machine is available in Pakistan with local suppliers dealing in used / refurbished machinery. However since the life of this machinery is very long (15 to 17 years) many people prefer using used machinery which requires a greater maintenance but the capital investment is very much low than the new machines. These machines usually come in two technological formats

- Computerized
- Analog

The most common brands for injection molding machinery are Jet Master, Super Jet, Mitsubishi, BM Biraghi, Engel, Horizon, Sintesi, Kawaguchi, Chicinnati, etc. The machines proposed for this setup are computerized machines of Japanese / American origin. Although Chinese machines are also available but locally the former (Japanese / American) machines are preferred.

5.2 Injection Mold

The molds are very costly and need to be carefully picked. Some molds are locally made but people usually prefer Chinese molds that are usually robust and refined. Used molds are also available in the market, which are proposed for this setup since they are cheap and efficient in delivering the desired products.

5.3 Coloring Machine

The coloring machine is a round shaped mixer which is similar to the common cement mixing machines mostly found near construction sites. The coloring machine is easily available from the local market.

6 HUMAN RESOURCE REQUIREMENT

The human resource requirement for the general and management staff are as follows:

GENERAL MANAGEMENT		
DESIGNATION / TYPE	**NUMBER**	**MONTHLY SALARY (RS.)**
Owner	01	-
Accountant	01	30,000
Purchaser	01	30,000
Office Assistant	01	25,000
Store / Warehouse Keeper	01	25,000
Guard (24 Hour)	01	25,000
Total	**06**	**135,000**

Considering the size of the proposed establishment it is assumed that the owner would be managing the overall affairs of the plastic molding setup. An accountant is required to

process and check bills, invoices, receivables management, maintain accounts, etc. for external and internal reporting. The accountant is required to update records and ensure safe custody of store keys.

The purchaser would be primarily responsible for making daily purchases; raw material purchases and other purchases as and when required. The purchaser would also assist the accountant in the safe custody of all inventories in the storeroom. The office assistant would be responsible for handling customers & complaints, following-up on bills and managing all day to day activities. One security guards would be required for ensuring security for the overall premises.

The following table gives the details for the proposed technical labor that forms the integral part of the total employee payroll:

TECHNICAL MANPOWER		
DESIGNATION / TYPE	**NUMBER**	**MONTHLY SALARY (RS.)**
Production Manager	01	60,000
Production Assistant	01	40,000
Shift Supervisor	01	30,000
Hydraulic Technician	01	25,000
Machine Operators	03	25,000
Helpers	02	25,000
Total	**09**	**205,000**

The Production Manager and Production Assistant should have considerable knowledge about polymer technology and properties preferably with diploma in plastic technology with 5 to 7 years' experience for the former and 2 to 3 years for the latter. The machine operators should also have relevant experience of handling and operating injection molding machines and plastic processing.

7 FINANCIAL ANALYSIS & KEY ASSUMPTIONS

The project cost estimates for the proposed Injection Molding Setup have been formulated on the basis of discussions with relevant stakeholders and experts. The cost projections cover the cost of land, building, inventory, equipment including office furniture etc. The specific assumptions relating to individual cost components are given as under:

7.1 Revenue & Cost Projections

The Sales are expected to increase by 7% every year while the cost of raw materials is assumed to increase by 5%. The 7% annual increase in revenue is expected to result from a

part increase in capacity utilization and part increase in product price. However the price of the plastic resins (Co-PP) is usually linked with the petrochemical prices, therefore the Investor is required to carefully negotiate the purchase price and manage the inventory level in coordination with the production personnel.

The prices used to calculate the gross revenue earned are based on the selling rate at which the Investor will charge the distributor. These basic prices do not include the selling and distribution margins and the since these would depend on the negotiation with the distributor. The prices are also exclusive of the General Sales Tax.

7.2 Rent Cost

The rent for the assumed premises will be Rs. 165,000/- per month. It is assumed that Rs. 12 lac will be given in advance along with four months rent, before possession of premises. This will include 3 months deposit and 3 month advance rent. The rent would be payable on a monthly basis and is expected to increase at the rate of 10% per annum for the projected period.

7.3 Utilities Requirement

The following table presents the assumed breakup of utilities on a monthly basis:

UTILITY	MONTHLY CHARGES (RS.)
Electricity	480,480
Telephone	5,600
Total	**486,080**

As depicted above the machines require considerable power during the injection molding process. The preheating procedure of the machine before commencement of production consumes a lot of time and electricity. Therefore it is advisable that the machines are kept on continuously for 24 hours and only shut down when the mold needs to be changed. It is assumed that utilities expenses will increase by 10% every year.

7.4 Depreciation on Building & Equipment

Depreciation on Building is 05%, Machinery and Office Furniture & Fixtures is assumed to be at the rate of 10% per annum based on the diminishing balance method for the projected period.

7.5 Machine Maintenance

The Injection Molding Machines and molds have a long life however the maintenance cost of the machines are usually very high since they need to be oiled and cleaned regularly specially before installing a new mold or starting a fresh production process. The yearly

maintenance cost has been taken to be Rs 02 per production quantity produced. Quantity increase with 05% increase in price

7.6 Working Capital & Pre Operating Costs

It is estimated that an additional amount of approximately **Rs. 5,918,805/-** will be required as cash in hand to meet the working capital requirements / contingency cash for the initial stages. The requirement is based on the rent, utilities and salaries expenses for at least four months and four months raw material inventory. The following table gives the break up.

ITEM	4 MONTHS COST (RS.)
Equipment spare part inventory	123,188
Raw Material Inventory	10,002,032
Upfront building rent	660,000
Upfront insurance payment	302,500
Salaries	1,360,000
Utilities	1,944,320
Cash	2,000,000
Total	**16,392,040**

The provision for pre operating costs is assumed to be **Rs. 400,000** which will be amortized equally over a 5 year period.

7.7 Account Receivables

A collection period of 45 days is assumed for sales. Further provision for bad debts has been assumed equivalent to 1.5% of Gross Sales.

7.8 Traveling & Miscellaneous Office Expenses

A monthly figure of Rs. 27,300 is assumed to be incurred for traveling expenses and office purchases which are expected to increase at the rate of 8% per annum for the projected period.

7.9 Taxation

The tax rate applicable to sole proprietorship is the same as that of the salaried individual. Therefore, we are assuming that the tax rate would be the same for the proposed injection molding setup.

7.10 Owner's Withdrawal

It is assumed that the owner with withdraw from the business once the desired profitability is reached from the start of operations. The amount would depend on business sustainability and availability of funds for future growth.

Key Assumptions

Item	Assumption(s)
Sales Increase Growth Rate	7 % per year
Increase in Cost of Raw Materials	05 % per year
Increase in Staff Salaries	10 % per year
Increase in Utilities (Electricity / Water / Gas)	10 % per year
Increase in Rent	10 % per year
Increase in Office Expenses	10 % per year
Debt / Equity Ratio	0 : 100
Depreciation	
o Plant Building	05 % per annum (Diminishing Balance)
o Machinery & Molds	10 % per annum (Diminishing Balance)
o Office Furniture & Equipment	10 % per annum (Diminishing Balance)
Machine Annual Maintenance Cost	Rs. 02 per production quantity
Receivables	30 Days
Bad Debts	1.5% of Gross Sales
Finished Goods Inventory	15 Days
Raw Materials Inventory	30 Days
Tax Rate	Income Tax on Salaried Individuals

PROJECTED FINANCIAL STATEMENTS

Statement Summaries — SMEDA

Income Statement

Rs. in actuals

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Revenue	54,010,968	57,791,736	61,837,157	66,165,758	70,797,361	75,753,177	81,055,899	86,729,812	92,800,899	99,296,962
Cost of goods sold	40,371,417	42,909,740	45,608,306	48,496,422	51,588,963	54,902,085	58,453,336	62,261,787	66,348,173	70,735,044
Gross Profit	13,639,551	14,881,996	16,228,851	17,669,336	19,208,398	20,851,092	22,602,563	24,468,025	26,452,725	28,561,917
	25%	26%	26%	27%	27%	28%	28%	28%	29%	29%
General administration & selling expenses										
Administration expense	1,560,000	1,711,884	1,878,555	2,061,454	2,262,160	2,482,407	2,724,098	2,989,320	3,280,364	3,599,745
Rental expense	1,980,000	2,178,000	2,395,800	2,635,380	2,898,918	3,188,810	3,507,691	3,858,460	4,244,306	4,668,736
Travelling & Comm. expense (phone, fax, etc.)	327,600	359,496	394,497	432,905	475,054	521,306	572,061	627,757	688,877	755,946
Office expenses (stationary, etc.)	93,600	102,713	112,713	123,687	135,730	148,944	163,446	179,359	196,822	215,985
Promotional expense	540,110	577,917	618,372	661,658	707,974	757,532	810,559	867,298	928,009	992,970
Insurance expense	907,500	816,750	726,000	635,250	544,500	453,750	363,000	272,250	181,500	90,750
Professional fees (legal, audit, etc.)	270,055	288,959	309,186	330,829	353,987	378,766	405,279	433,649	464,004	496,485
Depreciation expense	1,980,900	1,980,900	1,980,900	1,980,900	1,980,900	1,980,900	1,980,900	1,980,900	1,980,900	1,980,900
Amortization expense	80,000	80,000	80,000	80,000	80,000	-	-	-	-	-
Miscellaneous expense	810,165	866,876	927,557	992,486	1,061,960	1,136,298	1,215,838	1,300,947	1,392,013	1,489,454
Subtotal	8,549,929	8,963,495	9,423,580	9,934,549	10,501,182	11,048,712	11,742,872	12,509,940	13,356,795	14,290,972
Operating Income	5,089,622	5,918,501	6,805,271	7,734,787	8,707,216	9,802,380	10,859,691	11,958,084	13,095,930	14,270,946
	37%	40%	42%	44%	45%	47%	48%	49%	50%	50%
Earnings Before Interest & Taxes	5,089,622	5,918,501	6,805,271	7,734,787	8,707,216	9,802,380	10,859,691	11,958,084	13,095,930	14,270,946
Earnings Before Tax	5,089,622	5,918,501	6,805,271	7,734,787	8,707,216	9,802,380	10,859,691	11,958,084	13,095,930	14,270,946
Tax	946,886	1,195,550	1,501,845	1,827,175	2,167,526	2,550,833	2,920,892	3,305,330	3,703,575	4,114,831
NET PROFIT/(LOSS) AFTER TAX	4,142,735	4,722,951	5,303,426	5,907,612	6,539,690	7,251,547	7,938,799	8,652,755	9,392,354	10,156,115
	8%	8%	9%	9%	9%	10%	10%	10%	10%	10%
Balance brought forward		4,142,735	8,865,686	14,169,112	20,076,724	26,616,414	33,867,961	41,806,760	50,459,515	59,851,870
Total profit available for appropriation	4,142,735	8,865,686	14,169,112	20,076,724	26,616,414	33,867,961	41,806,760	50,459,515	59,851,870	70,007,984
Dividend	-	-	-	-	-	-	-	-	-	-
Balance carried forward	4,142,735	8,865,686	14,169,112	20,076,724	26,616,414	33,867,961	41,806,760	50,459,515	59,851,870	70,007,984

Statement Summaries — SMEDA

Balance Sheet

Rs. in actuals

	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	2,315,000	4,862,607	11,392,177	18,234,274	25,624,835	33,586,598	42,113,704	51,255,375	61,031,556	71,460,490	89,180,530
Accounts receivable	-	4,439,258	4,594,632	4,916,256	5,260,394	5,628,621	6,022,625	6,444,209	6,895,303	7,377,974	7,894,433
Finished goods inventory	-	1,755,279	1,790,078	1,902,655	2,023,140	2,152,152	2,290,366	2,438,515	2,597,393	2,767,866	2,950,875
Equipment spare part inventory	30,797	36,449	41,390	47,002	53,374	60,610	68,827	78,158	88,755	100,788	-
Raw material inventory	2,500,508	2,756,810	3,039,383	3,350,920	3,694,389	4,073,064	4,490,553	4,950,834	5,458,295	6,017,770	-
Pre-paid building rent	165,000	181,500	199,650	219,615	241,577	265,734	292,308	321,538	353,692	389,061	-
Pre-paid lease interest	-	-	-	-	-	-	-	-	-	-	-
Pre-paid insurance	907,500	816,750	726,000	635,250	544,500	453,750	363,000	272,250	181,500	90,750	-
Total Current Assets	5,918,805	14,848,652	21,783,309	29,305,971	37,442,207	46,220,530	55,641,383	65,760,880	76,606,494	88,204,700	100,025,837
Fixed assets											
Building/Infrastructure	1,980,000	1,881,000	1,782,000	1,683,000	1,584,000	1,485,000	1,386,000	1,287,000	1,188,000	1,089,000	990,000
Machinery & equipment	18,150,000	16,335,000	14,520,000	12,705,000	10,890,000	9,075,000	7,260,000	5,445,000	3,630,000	1,815,000	-
Furniture & fixtures	325,000	292,500	260,000	227,500	195,000	162,500	130,000	97,500	65,000	32,500	-
Office equipment	344,000	309,600	275,200	240,800	206,400	172,000	137,600	103,200	68,800	34,400	-
Total Fixed Assets	20,799,000	18,818,100	16,837,200	14,856,300	12,875,400	10,894,500	8,913,600	6,932,700	4,951,800	2,970,900	990,000
Intangible assets											
Pre-operation costs	400,000	320,000	240,000	160,000	80,000	-	-	-	-	-	-
Total Intangible Assets	400,000	320,000	240,000	160,000	80,000	-	-	-	-	-	-
TOTAL ASSETS	27,117,805	33,986,752	38,860,509	44,322,271	50,397,607	57,115,030	64,554,983	72,693,580	81,558,294	91,175,600	101,015,837
Liabilities & Shareholders' Equity											
Current liabilities											
Accounts payable	-	2,726,212	2,877,019	3,035,354	3,203,078	3,380,811	3,569,217	3,769,015	3,980,974	4,205,926	3,890,048
Total Current Liabilities	-	2,726,212	2,877,019	3,035,354	3,203,078	3,380,811	3,569,217	3,769,015	3,980,974	4,205,926	3,890,048
Shareholders' equity											
Paid-up capital	27,117,805	27,117,805	27,117,805	27,117,805	27,117,805	27,117,805	27,117,805	27,117,805	27,117,805	27,117,805	27,117,805
Retained earnings	-	4,142,735	8,865,686	14,169,112	20,076,724	26,616,414	33,867,961	41,806,760	50,459,515	59,851,870	70,007,984
Total Equity	27,117,805	31,260,540	35,983,491	41,286,917	47,194,529	53,734,219	60,985,766	68,924,565	77,577,320	86,969,674	97,125,789
TOTAL CAPITAL AND LIABILITI	27,117,805	33,986,752	38,860,509	44,322,271	50,397,607	57,115,030	64,554,983	72,693,580	81,558,294	91,175,600	101,015,837

Statement Summaries — SMEDA

Cash Flow Statement

Rs. in actuals

	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	-	4,142,735	4,722,951	5,303,426	5,907,612	6,539,690	7,251,547	7,938,799	8,652,755	9,392,354	10,156,115
Add: depreciation expense	-	1,980,900	1,980,900	1,980,900	1,980,900	1,980,900	1,980,900	1,980,900	1,980,900	1,980,900	1,980,900
amortization expense	-	80,000	80,000	80,000	80,000	80,000	-	-	-	-	-
Accounts receivable	-	(4,439,258)	(155,374)	(321,624)	(344,138)	(368,228)	(394,003)	(421,584)	(451,095)	(482,671)	(516,458)
Finished good inventory	-	(1,755,279)	(34,799)	(112,577)	(120,484)	(129,012)	(138,214)	(148,149)	(158,878)	(170,473)	(183,008)
Equipment inventory	(30,797)	(5,652)	(4,942)	(5,611)	(6,372)	(7,236)	(8,217)	(9,331)	(10,596)	(12,033)	100,788
Raw material inventory	(2,500,508)	(256,302)	(282,573)	(311,537)	(343,469)	(378,675)	(417,489)	(460,282)	(507,461)	(559,475)	6,017,770
Pre-paid building rent	(165,000)	(16,500)	(18,150)	(19,965)	(21,962)	(24,158)	(26,573)	(29,231)	(32,154)	(35,369)	389,061
Pre-paid lease interest	-	-	-	-	-	-	-	-	-	-	-
Advance insurance premium	(907,500)	90,750	90,750	90,750	90,750	90,750	90,750	90,750	90,750	90,750	90,750
Accounts payable	-	2,726,212	150,806	158,336	167,724	177,732	188,407	199,797	211,959	224,952	(315,877)
Cash provided by operations	(3,603,805)	2,547,607	6,529,570	6,842,098	7,390,560	7,961,764	8,527,106	9,141,671	9,776,181	10,428,934	17,720,040
Cash provided by / (used for) financ	27,117,805	-	-	-	-	-	-	-	-	-	-
Investing activities											
Capital expenditure	(21,199,000)	-	-	-	-	-	-	-	-	-	-
NET CASH	2,315,000	2,547,607	6,529,570	6,842,098	7,390,560	7,961,764	8,527,106	9,141,671	9,776,181	10,428,934	17,720,040
Cash balance brought forward		2,315,000	4,862,607	11,392,177	18,234,274	25,624,835	33,586,598	42,113,704	51,255,375	61,031,556	71,460,490
Cash available for appropriation	2,315,000	4,862,607	11,392,177	18,234,274	25,624,835	33,586,598	42,113,704	51,255,375	61,031,556	71,460,490	89,180,530
Cash carried forward	2,315,000	4,862,607	11,392,177	18,234,274	25,624,835	33,586,598	42,113,704	51,255,375	61,031,556	71,460,490	89,180,530

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