
Pre-Feasibility Study (Pre-fabricated Construction Blocks)



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1 DISCLAIMER

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

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2 EXECUTIVE SUMMARY

The proposed project envisages the setup of a Pre-fabricated Construction Blocks manufacturing unit. Construction blocks industry is an important industrial sector and has registered with a growth rate of 7.05 percent. The seven plus growth in this sub-sector is due to rapid execution of work on various projects, increased investment in small scale construction and rapid implementation of development schemes and other projects of federal and provincial governments.¹

Proposed location for setting up a pre-fabricated construction blocks manufacturing unit largely depends on the availability of raw material and its transportation to the factory at low cost. Moreover, construction and allied industries produce environmental pollution which may cause bronchial diseases to the people and hence are preferred to be setup at a distance, in dedicated industrial zones in major cities of Pakistan.

Proposed Product Mix include: Solid Blocks, Hollow Blocks, Pavers and Kerbstones.

Installed capacity is **11.5 million** blocks per anum and initial capacity utilization is **50%** with **5%** increase in subsequent years up to the maximum capacity utilization of **70%**.

Total Cost Estimates is **Rs.68 million** with fixed investment **Rs.61.6 million** and working capital **Rs.6.4 million**.

Given the cost assumptions IRR and payback are **54%** and **2.57 years** respectively

The critical considerations or factors for success of the project are:

- Contacts with builders / constructors / Civil work consultants
- Contracts with raw material suppliers
- Active participation in Government tenders & prequalification bids
- Targeted marketing strategies for builders and developers

¹ Pakistan Economic Survey 2014-15

3 INTRODUCTION TO SMEDA

The Small and Medium Enterprises Development Authority (SMEDA) was established in October 1998 with an objective to provide fresh impetus to the economy through development of Small and Medium Enterprises (SMEs).

With a mission "to assist in employment generation and value addition to the national income, through development of the SME sector, by helping increase the number, scale and competitiveness of SMEs", SMEDA has carried out 'sectoral research' to identify policy, access to finance, business development services, strategic initiatives and institutional collaboration and networking initiatives.

Preparation and dissemination of prefeasibility studies in key areas of investment has been a successful hallmark of SME facilitation by SMEDA.

Concurrent to the prefeasibility studies, a broad spectrum of business development services is also offered to the SMEs by SMEDA. These services include identification of experts and consultants and delivery of need based capacity building programs of different types in addition to business guidance through help desk services.

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 **Pre-fabricated Construction Blocks** by providing them with a general understanding of the business with the intention of supporting potential investors in crucial investment decisions.

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

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

5 PROJECT PROFILE

5.1 OPPORTUNITY RATIONALE

Construction sector has been registered with a growth rate of 7.05 percent. The seven plus growth in this sub-sector is due to rapid execution of work on various projects, increased investment in small scale construction and rapid implementation of development schemes and other projects of federal and provincial governments.²

Housing and construction is one of the major drivers of growth in more than 70-100 other small industries are part of the construction industry³. In addition, for the building of roads, flyovers, bypasses and dams, there is a mass and consistent need of pre-fabricated blocks across the country. Various construction and real estate development projects which includes the projects of public sector development and private sector projects are in progress and are continuously being commissioned which will have high demand of prefabricated construction material all over the country.

Reduced prices of crude oil, coal, electricity tariff and transportation fares as well as the reduced interest rate regime are all positive for the construction industry. The aforementioned statistics provide enough evidences and ensure a steep and continuous growth vis-à-vis investment opportunity in the Prefabricated Construction Blocks business.

5.2 PROJECT BRIEF

The proposed project envisages the setup of a pre-fabricated construction blocks manufacturing unit. Construction blocks industry is an important industrial sector, producing blocks used as prefabricated material for various construction activities i.e. construction of road side pave ways, garage parking floorings, walls making, block paved driveways, and floor coverings of commercial buildings, etc.

It is easy to make a concrete block. The successful block yard must however make blocks of uniform quality and sell them at a price high enough to cover costs and make a reasonable profit. Before to start a block yard, it is essential therefore to investigate the economic feasibility of the venture. Determination of level of demand for blocks in the area (how many per month) and degree of competition from other block yards are important factors having a significant bearing on the feasibility of the venture. Then comes the cost estimation based on various methods of production and output. Factors which influence unit cost include:

² Pakistan Economic Survey 2014-15

³ Association of Builders and Developers (ABAD)

- Purchase price of site
- Cost of site improvements: fencing, paved areas for production and stockpiles, pathways, roadways and buildings
- Cost of equipment: concrete mixer, block making machine and miscellaneous equipment
- Cost of services: water and electricity
- Material costs
- Wastage
- Maintenance costs of site and equipment
- Output: number of blocks per day – dimensions of block, solid or hollow.
- Labor costs etc.

5.3 MARKET ENTRY TIMING

Blocks making business depends on activity and movement in construction industry. Housing and construction plus government initiated development projects demand mass availability of blocks all over the year. Therefore, a block manufacturing unit could be established at any time of the year.

5.4 PROPOSED BUSINESS LEGAL STATUS

The legal status of business tends to play an important role in any setup; the proposed business is assumed to operate on Sole Proprietorship basis.

5.5 PROJECT CAPACITY AND RATIONALE

Production capacity of the plant for the proposed pre-fabricated construction blocks manufacturing unit would be 35,000 blocks of different shapes and categories per day. It is estimated that Karachi alone has a daily demand of 0.5 million prefabricated construction

blocks⁴. However, as there are variety of concrete based pre-fabricated construction blocks, cost will largely depend on the selection of block types, which are as follows:

- Solid Blocks
- Hollow Blocks
- Pavers
- Kerbstones

5.5.1 Raw Material Sourcing

Raw material to be used for the production of concrete based block is available in the local market at reasonable price. Main production material components include: cement and sand/crushed stone. A number of suppliers are available for Sand and Crush in each region and area of Pakistan and could easily be contacted, whereas, cement could be procured from any well-known cement company. Cement suppliers could also be one of the sources for sand and crush supply reference. Low quality Chinese cement is also available in the local market which has been declared substandard for consumption by PSQCA.

Volatility in cement prices is the biggest threat while working in construction industry. This risk can be minimized by making long term supply contracts with the cement manufacturers which is a common practice of large scale industrial consumers of cement.

5.6 PROJECT INVESTMENT

A total of Rs. 68 million is estimated to be the cost of the project. The working capital requirement is estimated around 6.4 million and Rs. 61.6 million would be the fixed investment.

⁴ Based on discussions with the existing business operators in the formal sector of Pakistan

5.7 PROPOSED PRODUCT MIX

For the purpose of this pre-feasibility, following products are assumed to be manufactured:

| Products | Size | Natural Grey (Price per piece in Rs.) |
|----------------------|----------------------|--|
| Paving Blocks | | |
| Pave 1 | 197x97x60 mm | 15 |
| Pave 2 | 197x97x80 mm | 17 |
| Hollow Blocks | | |
| Hollow 1 | 10.16x20.32x40.64 mm | 46 |
| Hollow 2 | 15.24x20.32x40.64 mm | 66 |
| Hollow 3 | 20.32x20.32x40.64 mm | 73 |
| Kerbstone | | |
| Kerbstone | 450x300x150 mm | 234 |
| Solid Block 1 | 10.16x20.32x40.64 mm | 54 |
| Solid Block 2 | 15.24x20.32x40.64 mm | 83 |

5.8 RECOMMENDED PROJECT PARAMETERS

| Capacity | Human Resource | | Technology/Machinery |
|---|----------------------|-------------|-------------------------|
| 50% Capacity Utilization (based on 16 working hrs. daily) | 39 (Two Shift basis) | | Both Local and Imported |
| Financial Summary | | | |
| Project Cost | IRR | NPV | Payback Period |
| Rs. 68 million | 54% | 116,380,786 | 2.57 Years |

5.9 PROPOSED LOCATION

Proposed location for setting up a pre-fabricated construction blocks making unit largely depends on the availability of raw material and its transportation to the factory at low cost; however, factors like availability of manpower, utilities and easy access to the target markets should also be carefully examined. For this feasibility, we propose a location in industrial sectors in major cities of Pakistan where all aforementioned resources are available at reasonable price. Moreover, construction and allied industries produce environmental pollution which may cause bronchial diseases to the people and hence are preferred to be setup at a distance, in dedicated industrial zones.

The pre-fabricated construction blocks making units are being operated countrywide. The reason is the demand which is spread all over the country, though is concentrated around developed cities and towns i.e. Karachi, Lahore, Multan, Faisalabad, Peshawar, Quetta, Hyderabad, Sialkot etc.

5.10 KEY SUCCESS FACTORS / PRACTICAL TIPS FOR SUCCESS

Pre-fabricated construction blocks business is dependent on the pricing and margins given to builders, suppliers and retail customers. It also depends on efficient supply of blocks to the customer and transportation facilities provided to the prospective clients, retailers and order booking agents.

5.10.1 Conventional Order Booking Arrangements – Distribution

As we have discussed earlier, pre-fabricated construction blocks is one of the allied sectors of construction industry. Therefore, all raw material suppliers to the construction industry are considered to be the part of the distribution network for the pre-fabricated construction blocks.

A block maker when setting up a block yard, institutes contacts with the construction material suppliers, retailers and sign up a contract in order to appoint them as order booking agents. Generally, construction and building material supplier is the part of the whole chain, and brings together the customers and suppliers.

5.10.2 Ordering and Delivery Procedure:

Block maker appoints order booking agents (building material suppliers) within the city who entertain the customer. Customers usually send someone or personally go to the booking office and place the order which includes details indicating quantity, quality, size and time of delivery etc. Booking agent gets the payment in cash (mostly) and issues an order / delivery slip to the customer, showing order details.

Buyer hires a truck or loading vehicle and goes to the block yard, where he produces the order slip (in local term called perchi) to the person responsible for the physical delivery of the blocks. That person renders the order as given on the slip. After loading the vehicle he hands it over to the order booker and here ends the role of the block maker.

Pre-fabricated construction blocks producers also book direct orders at site office for the construction contractors, retail customers and builders on phone and supply directly to the identified delivery points; however, these types of facilities are provided only for bulk orders. Bulk deliveries typically account for around 30% of the total annual sales.

In the Pre-fabricated construction blocks industry, the role of the middle man is played by building material suppliers at a nominal margin of 1% to 2% of the order booked.

5.11 PRODUCT MARKETING

In the manufacturing industry, marketing is considered to be of significant importance. In the Pre-fabricated construction blocks industry, marketing parameters are very limited and largely associated with the construction sector's performance. Some of the marketing promotion activities which should duly be rendered are given below:

- Developing contacts with the building material suppliers, well known builders and contractors.
- Keep up to date information on civil and construction works initiated by local, provincial and central government.
- Draw linkages with material suppliers to the housing industry at town level.
- Emphasis on image development and building acquaintances across individual contractors serving private sector.
- Establish contacts with local civil engineering firms, individuals and professionals.

5.11.1 PRODUCT INFORMATION

Concrete can be molded in numerous shapes and sizes. The range of product which can be made is limited only by our imagination. For the purpose of calculation only three products which are mostly sold in Pakistan are taken.

HOLLOW BLOCK

Hollow block are made of Gravels, stone dust, sand and cement at different proportions. Hollow block is the substitute for regular blocks and bricks used in building and construction industry. Only they are bigger in size. These are low cost, durable, sound proof, salinity free and can be used easily. Concrete hollow block has variety of sizes, shapes, colors and textures. The result is a highly functional and beautiful building material that is popular within architects, engineers, contractors and others worldwide.

Advantages of Concrete Hollow Blocks:

- Economy in design of sub-structure due to reduction of loads.
- Saving in mortar for lying of blocks as compared to ordinary brick and blocks.
- Saving in mortar for plaster work.
- Uniform Plaster thickness of 12 mm can be maintained due to precision of the size of block as compared to ordinary brick/ block work where plaster thickness of average 20 mm is required to produce uniform and even plastered surface due to variations in the sizes.

- Insulation of walls is achieved due to cavity, which provides energy saving for all times.
- Similarly hollowness results in sound insulation.
- Paint on finished walls can be applied due to cavity, which provides energy saving for all times.
- No problem of the appearance of salts, hence great saving in the maintenance of final finishes to the walls.
- Laying of blocks is much quicker because of the uniformity of end product.

PAVERS

Pavers are made of Stone chips, crush Gravels, Stone Dust, Sand and Cement at different proportions. Paving Blocks are used for the pathways neighborhood, pedestrian, walkways in the garden and house carport yard. The usage now is not limited to the above mentioned areas. Due to the enhancement in making pavers for high traffic areas, the usage of concrete Pavers for roads and parking areas, even heavy load areas like Docks, Truck stands, Container yards etc is now preferred. The pavers have advantages over asphalt.

Advantages of Pavers:

- The many colors and textures available in pavers allow for more versatility in looks and styles than premix asphalt. Patterns, lines and images may be built into the paving.
- The interlocking action of pavers facilitates far better load distribution than the premix asphalt.
- In the event of changes or renovations being made in the paved area, any reclaimed blocks are not wasted, but may be used elsewhere.
- If services are required beneath the paving can be lifted without becoming damaged and can be re-laid without leaving any unsightly scars and at no further material cost.
- Add-ons are easily made in any size to match existing paving.
- Paving is more resistant to chemical attacks than premix asphalt, particularly in the case of petro-chemicals.

- The maintenance costs of paving are fraction of those of premix asphalt. Paving is more resistant to wear than premix asphalt.
- Drainage channels may be built into the design with paving.
- Finishing off around trees, etc., may be made with a header course, which is both attractive and practical.

Safety features which are particular to paving include:

- High skid resistance
- High luminance
- Rapid shedding of rainwater
- Low traffic noise levels

For these reasons, paving is usually the preferred material where the following conditions apply:

- Heavy industrial loading is applied to the surface.
- Stop/start traffic
- Turning and slewing wheels
- Petro-chemical or other contaminants in contact with the pavement surface.
- Cushion or solid tired wheels

Furthermore, it is known that asphalt surfaces need to be overlaid after some years of use. Some survey indicates that the period of time before an overlay is required may vary between 7 and 15 years. As the premix asphalt surface layer makes up approx. 27% to 37% of the total pavement cost. This is the amount that needs to be added at present costs if an asphalt overlay is required over the life of the asphalt pavement.

KERBSTONE

Kerbstones are made of Stone chips, crush Gravels, Stone Dust, Sand and Cement at different proportions depending on application. Kerbstones are used for the sides or as the name implies the curb of Streets, roads, walkways in the garden and house backyard. These are used in different ways on Highways also. The usage is not limited to the above mentioned areas. These are increasingly been used because of their strength and innumerable different shape, sizes and colors. Following are few advantages:

- The many colors and textures available in curbstones allow for more versatility in looks and styles than any other means. Patterns, lines and images may be built into the paving.
- Kerbstones are more resistant to chemical attacks, particularly in the case of petrochemicals.
- The maintenance costs of Kerbstones are low.
- Kerbstones are more resistant to wear.
- Due to their even look have better aesthetic value

6 SECTOR & INDUSTRY ANALYSIS

6.1 SECTOR CHARACTERISTICS AND OVERVIEW

Construction sector is one of the largest economic sectors of Pakistan in terms of employment. It directly and indirectly affects more than 40 allied industries which also includes pre-fabricated construction material industry. Block making has a significant position in the construction process particularly in the housing sector where prefabricated blocks are used extensively with more than 40% of the total structure of the building.

Traditional construction has been relying on hand made bricks rather than concrete block which have been a high cost option while selecting material for the house construction both in urban and rural areas of the country. Concrete based construction is comparatively new phenomena and historically has been employed in the urban areas where technology and machinery was introduced due to mass demand of building material and comparatively high average income.

Pre-fabricated construction block have different categories from smallest size of a brick to a huge sized pre-cast concrete bridges. However, for the purpose of this pre-feasibility, we have focused on the manufacturing setups where various types of blocks are manufactured with the help of automatic or semi-automatic plant and machinery. This sector is largely unorganized and no statistics are available in terms of how many block manufacturing units are working and their scale of operations. The pre-fabricated construction blocks manufacturing sector can be divided into three categories:

6.1.1 Organized Sector – Machine Blocks

Organized sector constitutes few major players in Karachi: Envicrete Private Limited, Hubcrete, Izhar Paver Blocks and Crete N Crete Private Limited. All companies use imported plants and machinery due to their large scale of operations. Standard blocks are generally available in the sizes of 8"x8"x16", 6"x8"x16" and 4"x8"x16". Product quality is defined in PSI (per square inch pressure) which a block can survive. Generally it depends on the use of block which varies from product to product. Housing construction purpose block has a normal PSI of 400 and pavers are manufactured with 5000 PSI strength.

6.1.2 Unorganized Sector – Machine Blocks

This sector mainly includes block yards where hand operated mechanical machines are used to make concrete blocks which lay six and above blocks at a time. Therefore, their operations are limited and usually work on the basis of area to area demand. Hundreds of such setups could be seen in each area of the country where these setups are fulfilling the local housing construction demand of blocks of three different sizes and strengths depending upon the individual requirements of the customer. Standard blocks are generally available in the sizes of 6"x8"x12", 5"x8"x12" and 4"x8"x12". As far as PSI is concerned, no defined standard could be found; however, 400 PSI is normal in this sector.

6.1.3 Unorganized Sector – Hand Made Blocks

This sector is gradually shrinking and now operating on a very small scale in the low income areas where concrete based structure is scarce. Single mold is used which lays only one block at a time. Such blocks are easily breakable; therefore they are generally not preferred even by the customers who have very limited capital to invest in house construction. The current scenario of this sector shows that most of such block yard operators are switching to machine made blocks option due to customer preference and production limitations of the hand made blocks making process.

6.2 ENVIRONMENTAL & PROTECTION ASPECTS

Block making results in persistent exposure to the asbestos (due to dust emission), which is a natural fiber found in the dust particles of cement and blocks. To avoid its harmful effect on human health, it is suggested to follow guidelines provided by the provincial agency of environment protection. These procedures do not particularly apply on the block manufacturing industry, rather, a standard material, product and process handling guidelines applicable to construction and allied industries are available on the website: www.environment.gov.pk

7 MARKET INFORMATION

7.1 MARKET POTENTIAL

Pre-fabricated construction blocks making units across the country are working mostly as unorganized sector (about 80%) and no reliable data is available, precisely, for the installed capacity and the number of units working etc. However, since it is an allied industry of the construction sector, growth in construction sector may be considered as a close proxy for the growth in pre-fabricated construction blocks sector which is 7.05%⁵. The Housing and Construction sector has also been declared as Industry.⁶

7.2 EXPORTS AND IMPORTS OF PRE-FABRICATED CONSTRUCTION BLOCKS

Pre-fabricated construction blocks or other products are heavy; hence there are limited opportunities for export due to high cost of transportation. The market scope for pre-fabricated construction blocks is found to be encouraging in local market with the increased demand from construction industry. There is also a sufficient demand from Govt. Contractors for lying of roads and construction of industries.

7.3 PROBLEM / THREATS TO THE PRE-FABRICATED CONSTRUCTION BLOCKS SECTOR

Local customs and traditions, non-availability of infrastructure facilities like roads and electricity are the major hurdles in the development of the sector.

- Absence of developed domestic market.

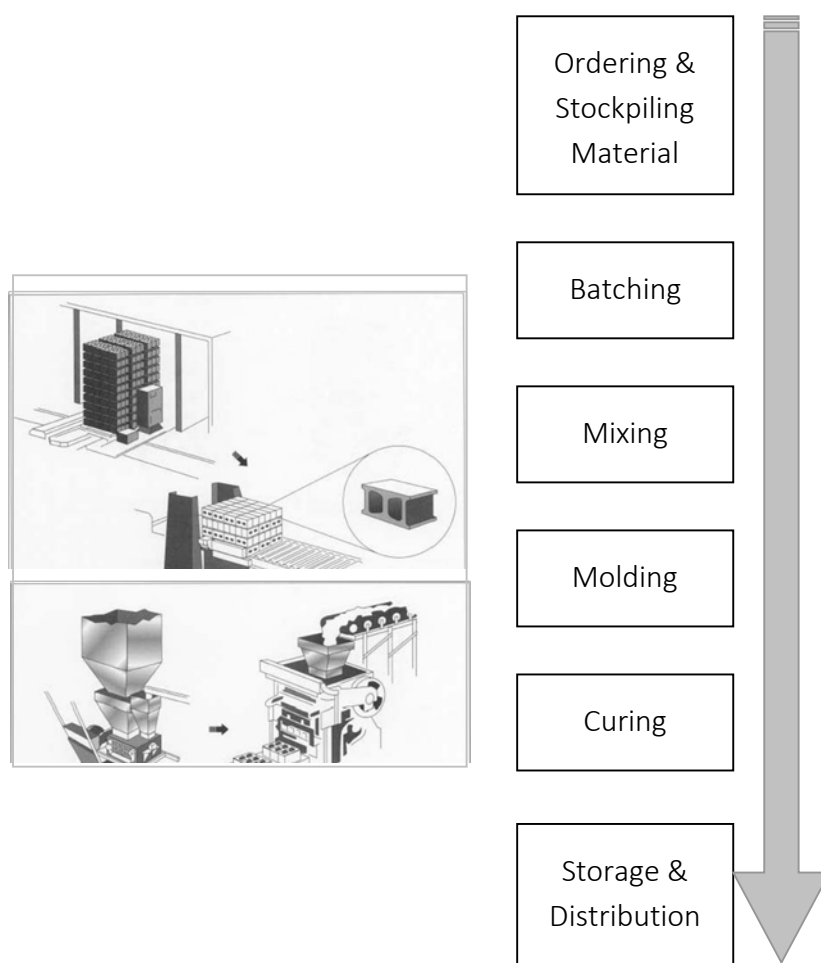
⁵ Economic Survey of Pakistan 2014-15

⁶ Finance Division Notification No.10 (10)/IF-II/98 dated 7-4-1999 and 4-6-1999

- Non-availability of modern machinery in local market at cheaper rates.
- Lack of investment friendly environment created by the relevant government agencies.

8 PRODUCTION PROCESS

8.1 PRE-FABRICATED CONSTRUCTION BLOCKS - PRODUCTION PROCESS FLOW



8.1.1 The Manufacturing Process

The production of concrete blocks consists of four basic processes: mixing, molding, curing, and cubing. Some manufacturing plants produce only concrete blocks, while others may produce a wide variety of pre-fabricated concrete products including blocks, flat paver stones, and decorative landscaping pieces such as lawn edging, etc.

The following steps are commonly used to manufacture concrete blocks:

Mixing

- The sand and gravel are stored outside in piles and are transferred into storage bins in the plant by a conveyor belt as they are needed. The Portland cement is stored outside in large vertical silos to protect it from moisture.
- As a production run starts, the required amounts of sand, gravel, and cement are transferred by gravity or by mechanical means to a weigh batcher, which measures the proper amounts of each material.
- The dry materials then flow into a stationary mixer where they are blended together for several minutes. There are two types of mixers commonly used. One type, called a planetary or pan mixer, resembles a shallow pan with a lid. Mixing blades are attached to a vertical rotating shaft inside the mixer. The other type is called a horizontal drum mixer. It resembles a coffee can turned on its side and has mixing blades attached to a horizontal rotating shaft inside the mixer.
- After the dry materials are blended, a small amount of water is added to the mixer. If the plant is located in a climate subject to temperature extremes, the water may first pass through a heater or chiller to regulate its temperature. Admixture chemicals and coloring pigments may also be added at this time. The concrete is then mixed for six to eight minutes.

Molding

- Once the load of concrete is thoroughly mixed, it is dumped into an inclined bucket conveyor and transported to an elevated hopper. The mixing cycle begins again for the next load.
- From the hopper, the concrete is conveyed to another hopper on top of the block machine at a measured flow rate. In the block machine, the concrete is forced downward into molds. The molds consist of an outer mold box containing several mold liners. The liners determine the outer shape of the block and the inner shape of the block cavities. As many as 15 blocks may be molded at one time.
- When the molds are full, the concrete is compacted by the weight of the upper mold head coming down on the mold cavities. This compaction may be supplemented by air

or hydraulic pressure cylinders acting on the mold head. Most block machines also use a short burst of mechanical vibration to further aid compaction.

- The compacted blocks are pushed down and out of the molds onto a flat steel pallet. The pallet and blocks are pushed out of the machine and onto a chain conveyor. In some operations, the blocks then pass under a rotating brush which removes loose material from the top of the blocks.

Curing

- The pallets of blocks are conveyed to an automated stacker or loader which places them in a curing rack. Each rack holds several hundred blocks. When a rack is full, it is rolled onto a set of rails and moved into a curing kiln.
- The kiln is an enclosed room with the capacity to hold several racks of blocks at a time. There are two basic types of curing kilns. The most common type is a low-pressure steam kiln. In this type, the blocks are held in the kiln for one to three hours at room temperature to allow them to harden slightly. Steam is then gradually introduced to raise the temperature at a controlled rate of not more than 60°F per hour (16°C per hour). Standard weight blocks are usually cured at a temperature of 150-165°F (66-74°C), while lightweight blocks are cured at 170-185°F (77-85°C). When the curing temperature has been reached, the steam is shut off, and the blocks are allowed to soak in the hot, moist air for 12-18 hours. After soaking, the blocks are dried by exhausting the moist air and further raising the temperature in the kiln. The whole curing cycle takes about 24 hours.
- Another type of kiln is the high-pressure steam kiln, sometimes called an autoclave. In this type, the temperature is raised to 300-375°F (149-191°C), and the pressure is raised to 80-185 psi (5.5-12.8 bar). The blocks are allowed to soak for five to 10 hours. The pressure is then rapidly vented, which causes the blocks to quickly release their trapped moisture. The autoclave curing process requires more energy and a more expensive kiln, but it can produce blocks in less time.

Cubing

- The racks of cured blocks are rolled out of the kiln, and the pallets of blocks are unstacked and placed on a chain conveyor. The blocks are pushed off the steel pallets, and the empty pallets are fed back into the block machine to receive a new set of molded blocks.

- If the blocks are to be made into split-face blocks, they are first molded as two blocks joined together. Once these double blocks are cured, they pass through a splitter, which strikes them with a heavy blade along the section between the two halves. This causes the double block to fracture and form a rough, stone-like texture on one face of each piece.
- The blocks pass through a cuber which aligns each block and then stacks them into a cube three blocks across by six blocks deep by three or four blocks high. These cubes are carried outside with a forklift and placed in storage.

8.1.2 Quality control

Three aspects should be monitored to ensure quality masonry units: strength, dimensions and shrinkage.

- **Strength:** Quality of blocks should be controlled so that strengths are adequate (to avoid breakages or rejection by customers) and mixes are as economical as possible. Ideally, blocks should be regularly tested for strength and mixes and production processes modified if necessary. If testing is impracticable or unaffordable, block strength should be continually assessed by noting whether corners and edges, or even whole blocks, tend to break in handling. Strength can also be assessed by knocking two mature bricks together.
- **Dimensions:** The length and width of the units are determined by the mould and will not vary greatly. However, the height can vary and should be monitored using a simple gauge. Units of inconsistent height will lead to difficulties in the construction of masonry and possible rain penetration.
- **Shrinkage:** Concrete masonry units shrink slightly after manufacture. In order to avoid this happening in the wall, blocks should be allowed to dry out for at least seven days before being used for construction.

8.2 RAW MATERIAL REQUIREMENT

8.2.1 CEMENT

Cement is the standard binder used with aggregates to make concrete products. The quality of cement, particularly with regard to the rate of strength gain and sensitivity to curing, or lack of curing in many cases, should be considered in choosing cement. Cement may be stored in paper bags but protected from any deterioration or in silos. Cement should preferably be

batched by mass, either using a full 50 kg bag or weighing each batch of cement either from a silo or opened bags. Volume batching must allow for the bulking of the cement, normally around 20%.

8.2.2 AGGREGATES

Aggregates form the bulk of concrete. They significantly affect the cost and quality of the final product and the ease with which the products are manufactured and finished. Aggregates used are mostly derived from solid rock, which is crushed or has been broken down by weathering. All sources of these aggregates preferably be checked to see they are of adequate quality. This might be done by testing the aggregates in a laboratory or by reference to the successful service performance of the aggregates in concrete.

In general, aggregates should consists of clean, hard, strong, dimensionally stable and durable particles free from clay coatings or foreign materials (especially organic matter) that may interfere with the normal strength development of the cement. Aggregates that do not have a reliable service performance record should be tested in a laboratory.

The aggregate is known in Pakistan as crush gravel, stone chips and stone dust as well.

8.2.3 PIGMENTS

Pigments may be used to coloring concrete products. The production of color-stable concrete requires care both in choice of colors and in the composition of the concrete mix. Specialist advice should be sought on best pigments to use to obtain the required color and their dosage.

The final choice of pigment and appropriate dosage will be made on the visual examination of dry concrete in which the pigment has been used. Usually in the preliminary stages, concrete is made with a range of dosages of cement pigment to determine the optimum dosage to give the required color. Dosages should not exceed 7% of the mass of cement.

8.2.4 WATER

Water in concrete makes the fresh concrete workable and reacts with the cement to give strength to the concrete; its quality is important. Water fit to drink is normally suitable. Evaluation of suspect water such as industrial wastewater, observing if the setting and strength gain of the concrete is affected may carry out water from underground mining activities and raw effluent.

Water is batched by volume. An experienced operator can judge the amount of water required in the particular concrete. If stored in tanks, the water should be protected from low temperatures, as this affects the setting time of the concrete and its rate of gain of strength.

In hot weather, water flowing in black pipes subject to direct sunlight can become excessively hot and cause rapid loss of workability of the concrete. Pipes should either be protected or insulated, or water should be stored when cool for subsequent use.

8.3 MACHINERY REQUIREMENT

Although small mixing and molding units are available in the local market, yet, complete mechanized plants are not available and organized setups are using imported plant and machinery for concrete block making. European and American plants are available which give good quality output; however, these are very expensive and not generally preferred even by the leading players due to high capital requirement. Therefore, we have selected Indonesian machinery for the proposed project which gives good quality output and is relatively more economical.

Machinery with the following specification has been proposed for the project which will cost around Rs. 29.2 million.

Technical Specifications

| | | |
|------------------|---------------------------|-----------------------------------|
| General | Dimension | 3200 (L) x 1830 (W) x 2600 (H) mm |
| | Pallet Size | 750 x 800 x 28 mm |
| | Effective Production Area | 650 x 780 mm |
| | Max./Min Prod. Height | 200 mm/60 mm |
| | Pallet Hopper | Up to 20 pallets |
| | Average Capacity | 1500 cycles/ 8 hrs |
| Operation | Electric Control | Semi Automatic |
| | Operator | 4 workers |

Installation Components

- Multiblock machine
- Pallet transfer unit
- Chain conveyor
- Belt Conveyor CB 8 M
- Dry concrete Mixer
- Batching plant
- Pallets
- Gantry crane with hoist

8.3.1 MACHINERY SUPPLIER 1

| | | | |
|--|---|------------|----------------|
| Name of Supplier / Organization | PT. Surya Baja Sentral Anugerah | | |
| Address | Kutisari Utara no.46, Surabaya, East Java, Indonesia 60291 | | |
| Phone | +62-31-8533250 | Fax | +62-31-8552516 |
| Website | http://www.suryabaja.com | | |

8.3.2 MACHINERY SUPPLIER 2

| | | | |
|--|---|--|--|
| Name of Supplier / Organization | Mr. Hon Wu / Quanzhou City Licheng Huangshi Machinery Co., Ltd. | | |
| Address | Fujian, China (Mainland) | | |
| Website | https://huangshimachinery.en.alibaba.com/ | | |

8.3.3 MACHINERY SUPPLIER 3

| | | | |
|--|--|------------|------------------|
| Name of Supplier / Organization | Fujian Quanzhou Honcha Machine Make Co., Ltd. | | |
| Address | Huaqiao Economic&Development Zone, Xuefeng,Nan'an, Quanzhou, Fujian, China, 362332 | | |
| Phone | +86-595-22496062 | Fax | +86-595-22496061 |
| E-mail | Enquiry@honcha.com | | |
| Website | http://en.honcha.com/index.html | | |

8.4 VEHICLES FOR TRANSPORTATION

The proposed setup would require three to four vehicles (new machinery has been considered for the proposed project) to carryout transportation of raw material and finished products. Besides, dumping and loading vehicles for the transportation of finished product to the stacking points would be a pre-requisite. Details of required vehicles have been provided in the following table:

| S. No. | Name of Vehicle / Machine | Purpose of the Machine | No. of Units Required | Total Cost |
|--------|---------------------------|-------------------------------|-----------------------|------------------|
| 1 | Trucks | Material Transportation | 02 | 1,600,000 |
| 2 | Fork Lifter | Finished goods transportation | 01 | 1,500,000 |
| 3 | Other Tools & Equipment | | | 200,000 |
| | Total | | | 3,300,000 |

**Machinery cost depends on model and may vary*

During the discussions with the market experts and entrepreneurs, it was observed that, though the above machinery/vehicle could also be hired on rent, yet, the incremental cost difference between rented and purchased machinery would be very close over a long period of time. Therefore it would be preferred to acquire own machinery rather than obtaining these services on rent.

8.5 PLANT AND MACHINERY MAINTENANCE

Machinery is expected to be serviced on an annual basis. During the projected period, maintenance expenses are estimated to be around 5% of the total cost of machine.

9 LAND & BUILDING REQUIREMENT

9.1 SITE DEVELOPMENT

The Pre-fabricated construction blocks project is estimated to require a total area of one acre, which will be used for stockpiling of raw material, production of blocks, cement storage and storage of finished product. Since heavy machinery and vehicles i.e. dumper, fork lifters etc. would be used which require open space for the movement as well as there will be frequent movement of heavy transportation and delivery vehicles; therefore, large land requirement is being recommended. Moreover, the space would also be used for machinery installation, storage and vehicle parking and different services necessary for the project.

9.2 LAND & BUILDING REQUIREMENTS

9.2.1 Selecting a site

In selecting a site, consider location, access, ground slope and size. Each of these is discussed below.

Location

This should be considered in relation to:

- Supply of raw materials
- Market for blocks
- Location of the labour force
- Security of the area
- Availability of services, i.e. roads, water, sewerage, electricity, etc.

Access

The site must be accessible to trucks delivering aggregates and cement and collecting finished blocks.

Ground slope

Ideally, the site should be level or nearly so. Steep slopes make handling and production difficult. Terracing a steep slope is expensive.

Size

The site should be big enough for aggregate stockpiles, cement storage, production (slab or stationary machine) block stacking, staff facilities, an office and on-site access. With all provisions for the business, one acre would be sufficient for the project.

9.2.2 Establishing the site

The site should have provision for stockpiling aggregates and storing cement, a production area, a stacking area, staff facilities, an office, and access between different areas and facilities. Each of these is discussed below.

Aggregate stockpiles

Aggregates must be stockpiled in such a way that: they do not become contaminated by soil, leaves, etc; different aggregates are kept separate; and rainwater can drain away. Ideally therefore, aggregates should be stockpiled on a concrete slab. If this is not done, the layer of aggregates in contact with the soil should not be used for production. Aggregates must not be stockpiled under trees. Partitions should be erected between different types of aggregate. Stockpiles should be on a slight slope so that rainwater does not collect in the aggregates.

Cement store

The best way to store cement is in a silo. For small scale block yards, however, cement will be delivered in bags. Cement in bags should preferably be stored in a weather-proof room. Bags should be stacked on a plastic tarpaulin or on closely spaced wooden strips so that they do not absorb damp from the floor. The storeroom should be big enough to hold at least a week's supply of cement. If it is not possible to provide a storeroom, cement in bags should be stored in stacks raised above the ground and completely covered with tarpaulins.

Production area

The size of this area depends on the method of producing blocks. A stationary machine, which forms blocks on pallets, needs a relatively small area with space around it for operators. A mobile “egg-laying” machine needs a fairly large slab on which blocks are made. Details of such a slab are discussed below.

Construction of a production slab

- **Area:** A flat concrete slab, big enough for at least one day’s production, is required. To minimize breakages in cold weather, it is recommended to increase the cement content of the mix or the curing period before moving the blocks.
- **Slope:** Normally block production is carried out in the open, and the concrete slab should have a minimum slope of 1 in 100 to ensure proper drainage.
- **Thickness:** Large production machines require a minimum slab thickness of 150 mm.
- **Joints:** To prevent uncontrolled cracking of the slab, it should be divided into panels which should be square or as close to square as possible. The half round keyway prevents differential settlement of adjacent slabs. The maximum joint spacing depends on the thickness of the slab and should not exceed 6 m for slab thicknesses of 150 and 200 mm.
- **Stacking area:** An area big enough to stack two weeks’ production is needed for curing and drying blocks. It is normally not necessary to pave this area. To avoid muddy conditions, a layer of concrete stone, about 100 mm thick, should be enough.
- **Office and Staff facilities:** These include toilets, ablutions, and possibly change rooms. An office should be provided for all but the smallest of yards.

Land and building requirements for the project would be as follows:

| Details | Size/Area (Sq. Ft.) | Civil Works /Construction Cost/Sq. Ft. | Total Construction Cost |
|--------------------------------|---------------------|--|-------------------------|
| Management Building | 1,000 | 2,000 | 2,000,000 |
| Production & Stacking Area | 5,000 | 1,800 | 9,000,000 |
| Cement Store | 5,000 | 1,200 | 6,000,000 |
| Water Tank | 2,000 | 800 | 1,600,000 |
| Cafeteria & Staff Facilities | 500 | 2,000 | 1,000,000 |
| Pavement / Driveway | 4,000 | 150 | 600,000 |
| Ground | 69,650 | 05 | 348,250 |
| Total Construction Cost | | | 20,548,250 |

The factory would be located at any industrial areas in major cities of Pakistan. The reason for the selection is that utilities, water, electricity and skilled manpower are conveniently available, whereas, comparatively low cost of land, proximity to the target market, good transport and communication facilities, also account for its selection.

10 HUMAN RESOURCE REQUIREMENT

Construction and allied industry is a labor intensive industry; therefore, a total 39 persons will be required to handle the production operations of a pre-fabricated construction blocks making unit. The business unit will work on two shift basis (16 hours daily). Technical staff with relevant experience will be required for operating production plant. The staff will be provided training by the plant & machinery supplier. Total approximate manpower required for the business operations along with the respective salaries are given in the table below:

| Staff Title | No of Persons | Monthly Salary | Annual Salary |
|------------------------------|---------------|----------------|------------------|
| CEO | 01 | 120,000 | 120,000 |
| Manager Operations | 02 | 85,000 | 170,000 |
| Manager Marketing | 01 | 75,000 | 75,000 |
| Assistant Manager Operations | 04 | 60,000 | 240,000 |
| Assistant Manager Finance | 01 | 60,000 | 60,000 |
| Assistant Manager Marketing | 02 | 50,000 | 100,000 |
| Operation Staff | 16 | 15,000 | 240,000 |
| Receptionist | 01 | 15,000 | 15,000 |
| Outdoor Staff | 02 | 15,000 | 30,000 |
| Peon | 02 | 13,000 | 26,000 |
| Guards | 04 | 13,000 | 52,000 |
| Drivers | 03 | 15,000 | 45,000 |
| TOTAL | 39 | 536,000 | 1,173,000 |

10.1 Experience Requirement for the Staff

One to two year of experience on mechanized block making plant would be necessary for the person who will operate the pre-fabricated construction blocks plant. It is also suggested that preference should be given to literate persons so that they could understand the significance of undertaking health and safety measures.

11 FINANCIAL ANALYSIS & KEY ASSUMPTIONS

The project cost estimates for the proposed “construction blocks Business” have been formulated on the basis of discussions with industry stakeholders and experts. The projections cover the cost of land, machinery and equipment including office equipment, fixtures etc. Assumptions regarding machinery have been provided, however, the specific assumptions relating to individual cost components are given as under.

11.1 LAND & BUILDING

Land for setting up the proposed pre-fabricated construction blocks unit would be purchased which will incur a cost of approximately Rs. 2.5 million. Construction and renovation of site will cost around Rs. 20 million which has been assumed to depreciate at 05% per annum using diminishing balance method.

11.2 FURNITURE & FIXTURE

A lump sum provision of Rs. 258,000 for procurement of office/factory furniture is assumed. This would include table, desk, chairs, and office stationery. The breakup of Factory Office Furniture & Fixtures is as follows:

| Description | Quantity | Unit Cost (Rs.) | Total Cost (Rs.) |
|----------------------------|----------|-----------------|------------------|
| Office Tables & Chairs | 5 | 12,000 | 60,000 |
| Waiting Area Chairs | 8 | 3,000 | 24,000 |
| Chairs for Workers/Labor | 12 | 2,000 | 24,000 |
| Electric wiring & lighting | 1 | 50,000 | 50,000 |
| Air conditioners (1.5 ton) | 2 | 50,000 | 100,000 |
| TOTAL | | | 258,000 |

11.3 OFFICE EQUIPMENT REQUIREMENT

Following office equipment will be required for Name of Pre-feasibility Study:

| Description | Quantity | Unit Cost (Rs.) | Total Cost (Rs.) |
|--------------------|----------|-----------------|------------------|
| Laptops | 05 | 45,000 | 225,000 |
| Printer | 01 | 30,000 | 30,000 |
| Telephone Exchange | 01 | 50,000 | 50,000 |
| Telephones | 05 | 2,000 | 10,000 |
| Fax Machine | 01 | 25,000 | 25,000 |
| TOTAL | | | 340,000 |

11.4 DEPRECIATION TREATMENT

The treatment of depreciation would be on a diminishing balance method at different rate per annum on the following. The method is also expected to provide accurate tax treatment.

- Plant & machinery (10%)
- Building Construction and Renovation (5%)
- Vehicles (25%)
- Furniture and Fixtures etc. (10%)

11.5 UTILITIES

Pre-fabricated construction blocks plant will be operated using electricity for production purposes. This would draw considerable amount of electricity. Likewise, heavy vehicles i.e. Fork lifter, truck/dumper, etc would require huge quantity of fuel for which diesel will be used. The cost of the utilities including electricity, diesel/fuel, telephone, and water is estimated to be around Rs. 55 million per annum. Approximate cost of utilities has been given below:

| Utility | Total Monthly Cost (Rs.) | Total Annual Cost (Rs.) |
|------------------------------|--------------------------|-------------------------|
| Power (Genset & Electricity) | 2,645,933 | 31,751,192 |
| Water | 1,895,143 | 22,741,714 |
| Telephone, Fax, Internet | 33,150 | 397,800 |
| Total | 4,574,226 | 54,890,706 |

11.6 PROJECT INVESTMENT DETAILS

This section will provide the total cost of the project:

| DESCRIPTION | AMOUNT (Rs.) |
|--------------------------------|-------------------|
| Capital Cost | |
| Land | 2,500,851 |
| Building / Infrastructure | 20,548,250 |
| Machinery & Equipment | 32,081,980 |
| Furniture & Fixtures | 258,000 |
| Office Vehicles | 1,919,000 |
| Office Equipment | 340,000 |
| Pre-operating Costs | 3,508,000 |
| Training Costs | 500,000 |
| Total Capital Cost | 61,656,081 |
| Working Capital | |
| Equipment Spare Part Inventory | 122,008 |
| Raw Material Inventory | 3,619,843 |
| Upfront Insurance Payment | 1,700,049 |
| Cash | 1,000,000 |
| Total Working Capital | 6,441,900 |
| TOTAL PROJECT COST | 68,097,981 |

11.7 VEHICLE FOR SUPPORT AND MAINTENANCE SERVICES

An additional bikes would be required for providing services for the maintenance, communication of machinery spare parts, etc, other than the vehicles described in “8.4 Vehicles for transportation”. For this purpose, a 06 bikes has been proposed and an amount of Rs. 300,000 is assumed to be required to purchase the vehicle.

11.8 SELLING & DISTRIBUTION EXPENSES (ORDER BOOKING AGENTS)

For the purpose of this business plan, it has been assumed that the block maker would work in association with building material suppliers and will appoint 5 to 6 suppliers as booking agents. These arrangements would raise the selling costs for the business for which an amount equivalent to 2% of the annual sales has been assumed which also covers the distribution cost of bulk supplies, entertained directly by the owner.

11.9 MISCELLANEOUS EXPENSES

Miscellaneous expenses of running the business are assumed to be Rs. 1,000,000 per annum and are assumed to increase at a nominal rate of 10% per annum.

11.10 REVENUE PROJECTIONS

For the revenue projections, pre-fabricated construction blocks are assumed to be produced as follows:

| Products | Percentage allocation | Monthly Production | Annual Production | Sales Revenue |
|----------------------|-----------------------|--------------------|-------------------|---------------|
| Paving Blocks | | | | |
| Pave 1 | 15% | 220,968 | 2,651,616 | 40,302,035 |
| Pave 2 | 15% | 365,904 | 4,390,848 | 72,928,768 |
| Hollow Blocks | | | | |
| Hollow 1 | 10% | 57,288 | 687,456 | 31,431,065 |
| Hollow 2 | 10% | 57,288 | 687,456 | 45,051,193 |

| | | | | |
|-------------------|-------------|----------------|-------------------|--------------------|
| Hollow 3 | 10% | 40,920 | 491,040 | 35,754,915 |
| Curb Stone | | | | |
| Curb | 10% | 16,368 | 196,416 | 46,028,452 |
| Solid Block 1 | 15% | 122,760 | 1,473,120 | 79,893,740 |
| Solid Block 2 | 15% | 73,656 | 883,872 | 73,165,847 |
| Total | 100% | 955,152 | 11,461,824 | 424,556,013 |

Working with the proposed plant and machinery, the project will be capable of producing 17,000 pieces of concrete blocks at 50% capacity utilization with double shift of 08 hours a day. Annual increase of 5% in capacity utilization is assumed over the projection period. All projections are based on 16 working hrs a day with 26 days a month.

Based on our discussions with the industry experts and entrepreneurs it is assumed that the sales price will increase with a nominal rate of 10% on all product categories during the projected period.

11.11 ACCOUNTS RECEIVABLES

Considering the industry norm, particular to the construction sector and all of its allied industries, it has been assumed that 70% of the sales will be on cash. Whereas, remaining 30% sales will be on credit to the builders and construction contractors. A collection period of 60 days is assumed for the credit sales.

All of the above assumptions are based on our findings during the discussions with the industry experts and stakeholders. A provision for bad debts has been assumed equivalent to 2% of the annual credit sales.

11.12 TAXATION

The tax rate applicable to sole proprietorship is the rates of tax imposed on the taxable income of every individual. Therefore, we are assuming that the tax rate would be the same for the proposed Pre-fabricated Construction Blocks setup.

11.13 Source Of Capital

The source of capital is presented in the following table:

| Particulars | Rate |
|-------------|-------|
| Debt | 0 % |
| Equity | 100 % |

11.14 OWNER'S WITHDRAWAL

It is assumed that the owner will draw funds 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.

12 USEFUL WEB LINKS

| | Websites |
|--|--|
| Small & Medium Enterprises Development Authority (SMEDA) | www.smeda.org.pk |
| Government of Pakistan | www.pakistan.gov.pk |
| Ministry of Industries & Production | www.moip.gov.pk |
| Ministry of Education, Training & Standards in Higher Education | http://moptt.gov.pk |
| Government of Punjab | www.punjab.gov.pk |
| Government of Sindh | www.sindh.gov.pk |
| Government of Khyber Pakhtunkhwa | www.khyberpakhtunkhwa.gov.pk |
| Government of Balochistan | www.balochistan.gov.pk |
| Government of Gilgit Baltistan | www.gilgitbaltistan.gov.pk |
| Government of Azad Jamu Kashmir | www.ajk.gov.pk |
| Trade Development Authority of Pakistan (TDAP) | www.tdap.gov.pk |
| Security Commission of Pakistan (SECP) | www.secp.gov.pk |
| Federation of Pakistan Chambers of Commerce and Industry (FPCCI) | www.fpcci.com.pk |
| State Bank of Pakistan (SBP) | www.sbp.org.pk |
| Punjab Small Industries Corporation | www.psic.gop.pk |
| Sindh Small Industries Corporation | www.ssic.gos.pk |
| Pakistan Horticulture Development and Export Company (PHDEC) | www.phdec.org.pk |
| Punjab Vocational Training Council (PVTTC) | www.pvtc.gop.pk |
| Technical Education and Vocational Training Authority (TEVTA) | www.tevta.org |
| Pakistan Readymade Garment Technical Training Institute | www.prgmea.org/prgtti/ |
| Livestock & Dairy Development Department, Government of Punjab. | www.livestockpunjab.gov.pk |
| Punjab Industrial Estates (PIE) | www.pie.com.pk |
| Faisalabad Industrial Estate Development and Management Company (FIEDMC) | www.fiedmc.com.pk |

13 ANNEXURES

13.1 Income Statement

| Calculations | | | | | | | | | | SMEDA |
|---|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|--------------------|--------------------|--------------------|
| Income Statement | | | | | | | | | | |
| | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 | Year 8 | Year 9 | Year 10 |
| Revenue | 212,278,007 | 256,856,388 | 308,227,666 | 367,304,635 | 435,114,721 | 478,626,194 | 526,488,813 | 579,137,694 | 637,051,464 | 700,756,610 |
| <i>Cost of sales</i> | | | | | | | | | | |
| Cost of goods sold 1 | 86,876,231 | 103,208,962 | 121,598,922 | 142,270,739 | 165,471,814 | 178,709,559 | 193,006,323 | 208,446,829 | 225,122,576 | 243,132,382 |
| Operation costs 1 (direct labor) | 7,800,000 | 8,559,419 | 9,392,776 | 10,307,270 | 11,310,801 | 12,412,036 | 13,620,489 | 14,946,599 | 16,401,822 | 17,998,726 |
| Operating costs 2 (machinery maintenance) | 1,464,099 | 1,581,227 | 1,707,725 | 1,844,343 | 1,991,891 | 2,151,242 | 2,323,341 | 2,509,208 | 2,709,945 | 2,926,741 |
| Operating costs 3 (Diesel Genset) | 31,257,600 | 34,383,360 | 37,821,696 | 41,603,866 | 45,764,252 | 50,340,677 | 55,374,745 | 60,912,220 | 67,003,442 | 73,703,786 |
| Mold Replacement | 2,184,000 | 2,358,720 | 2,547,418 | 2,751,211 | 2,971,308 | 3,209,013 | 3,465,734 | 3,742,992 | 4,042,432 | 4,365,826 |
| Operating costs 4 (direct water) | 22,741,714 | 27,517,474 | 33,020,969 | 39,349,988 | 46,614,601 | 51,276,062 | 56,403,668 | 62,044,035 | 68,248,438 | 75,073,282 |
| Total cost of sales | 152,323,644 | 177,609,162 | 206,089,506 | 238,127,417 | 274,124,666 | 298,098,588 | 324,194,300 | 352,601,884 | 383,528,653 | 417,200,742 |
| Gross Profit | 59,954,363 | 79,247,226 | 102,138,159 | 129,177,218 | 160,990,055 | 180,527,606 | 202,294,513 | 226,535,811 | 253,522,810 | 283,555,868 |
| <i>General administration & selling expenses</i> | | | | | | | | | | |
| Administration expense | 6,276,000 | 6,887,040 | 7,557,572 | 8,293,388 | 9,100,844 | 9,986,915 | 10,959,255 | 12,026,264 | 13,197,158 | 14,482,052 |
| Administration benefits expense | 313,800 | 344,352 | 377,879 | 414,669 | 455,042 | 499,346 | 547,963 | 601,313 | 659,858 | 724,103 |
| Electricity expense | 493,592 | 542,951 | 597,246 | 656,971 | 722,668 | 794,934 | 874,428 | 961,871 | 1,058,058 | 1,163,863 |
| Travelling expense | 627,600 | 688,704 | 755,757 | 829,339 | 910,084 | 998,692 | 1,095,926 | 1,202,626 | 1,319,716 | 1,448,205 |
| Communications expense (phone, fax, mail, internet, etc.) | 313,800 | 344,352 | 377,879 | 414,669 | 455,042 | 499,346 | 547,963 | 601,313 | 659,858 | 724,103 |
| Office vehicles running expense | 767,600 | 844,360 | 928,796 | 1,021,676 | 1,123,843 | 1,236,227 | 1,359,850 | 1,495,835 | 1,645,419 | 1,809,961 |
| Office expenses (stationary, entertainment, janitorial services, etc) | 313,800 | 344,352 | 377,879 | 414,669 | 455,042 | 499,346 | 547,963 | 601,313 | 659,858 | 724,103 |
| Promotional expense | 10,613,900 | 12,842,819 | 15,411,383 | 18,365,232 | 21,755,736 | 23,931,310 | 26,324,441 | 28,956,885 | 31,852,573 | 35,037,831 |
| Insurance expense | 1,700,049 | 1,515,652 | 1,331,254 | 1,146,857 | 1,102,940 | 907,410 | 711,880 | 516,350 | 526,497 | 314,668 |
| Professional fees (legal, audit, consultants, etc.) | 1,061,390 | 1,284,282 | 1,541,138 | 1,836,523 | 2,175,574 | 2,393,131 | 2,632,444 | 2,895,688 | 3,185,257 | 3,503,783 |
| Depreciation expense | 4,775,161 | 4,775,161 | 4,775,161 | 4,775,161 | 4,997,812 | 4,997,812 | 4,997,812 | 4,997,812 | 5,323,797 | 5,323,797 |
| Amortization of pre-operating costs | 701,600 | 701,600 | 701,600 | 701,600 | 701,600 | - | - | - | - | - |
| Amortization of legal, licensing, and training costs | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | - | - | - | - | - |
| Bad debt expense | 6,368,340 | 7,705,692 | 9,246,830 | 11,019,139 | 13,053,442 | 14,358,786 | 15,794,664 | 17,374,131 | 19,111,544 | 21,022,698 |
| Miscellaneous expense 1 | 1,000,000 | 1,100,000 | 1,210,000 | 1,331,000 | 1,464,100 | 1,610,510 | 1,771,561 | 1,948,717 | 2,143,589 | 2,357,948 |
| Subtotal | 35,426,632 | 40,021,316 | 45,290,373 | 51,320,893 | 58,573,769 | 62,713,764 | 68,166,150 | 74,180,119 | 81,343,181 | 88,637,114 |
| Operating Income | 24,527,731 | 39,225,910 | 56,847,786 | 77,856,325 | 102,416,286 | 117,813,841 | 134,128,363 | 152,355,692 | 172,179,629 | 194,918,754 |
| Gain / (loss) on sale of office vehicles | - | - | - | 959,500 | - | - | - | 1,788,604 | - | - |
| Earnings Before Interest & Taxes | 24,527,731 | 39,225,910 | 56,847,786 | 78,815,825 | 102,416,286 | 117,813,841 | 134,128,363 | 154,144,296 | 172,179,629 | 194,918,754 |
| Earnings Before Tax | 24,527,731 | 39,225,910 | 56,847,786 | 78,815,825 | 102,416,286 | 117,813,841 | 134,128,363 | 154,144,296 | 172,179,629 | 194,918,754 |
| Tax | 8,584,706 | 13,729,068 | 19,896,725 | 27,585,539 | 35,845,700 | 41,234,844 | 46,944,927 | 53,950,503 | 60,262,870 | 68,221,564 |
| NET PROFIT/(LOSS) AFTER TAX | 15,943,025 | 25,496,841 | 36,951,061 | 51,230,286 | 66,570,586 | 76,578,997 | 87,183,436 | 100,193,792 | 111,916,759 | 126,697,190 |
| Balance brought forward | 11,160,118 | 11,160,118 | 25,659,871 | 43,827,652 | 66,540,557 | 93,177,800 | 118,829,758 | 144,209,236 | 171,082,119 | 198,099,215 |
| Total profit available for appropriation | 15,943,025 | 36,656,959 | 62,610,932 | 95,057,939 | 133,111,143 | 169,756,797 | 206,013,194 | 244,403,028 | 282,998,878 | 324,796,405 |
| Dividend | 4,782,908 | 10,997,088 | 18,783,280 | 28,517,382 | 39,933,343 | 50,927,039 | 61,803,958 | 73,320,908 | 84,899,663 | 97,438,922 |
| Balance carried forward | 11,160,118 | 25,659,871 | 43,827,652 | 66,540,557 | 93,177,800 | 118,829,758 | 144,209,236 | 171,082,119 | 198,099,215 | 227,357,484 |

13.2 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 | | | | | | | | | | | |
| <i>Current assets</i> | | | | | | | | | | | |
| Cash & Bank | 1,000,000 | 12,667,575 | 31,236,637 | 51,261,700 | 72,146,123 | 100,110,623 | 124,611,081 | 149,465,093 | 170,884,327 | 196,589,698 | 245,725,365 |
| Accounts receivable | | 17,447,507 | 19,279,496 | 23,222,632 | 27,761,601 | 32,976,138 | 37,550,997 | 41,306,096 | 45,436,706 | 49,980,376 | 54,978,414 |
| Finished goods inventory | | - | - | - | - | - | - | - | - | - | - |
| Equipment spare part inventory | 122,008 | 138,357 | 156,897 | 177,921 | 201,763 | 228,799 | 259,458 | 294,226 | 333,652 | 378,361 | - |
| Raw material inventory | 3,619,843 | 4,644,403 | 5,909,708 | 7,467,507 | 9,380,107 | 10,940,957 | 12,761,532 | 14,885,051 | 17,361,924 | 20,250,948 | - |
| Pre-paid insurance | 1,700,049 | 1,515,652 | 1,331,254 | 1,146,857 | 1,102,940 | 907,410 | 711,880 | 516,350 | 526,497 | 314,668 | - |
| Total Current Assets | 6,441,900 | 36,413,495 | 57,913,991 | 83,276,617 | 110,592,534 | 145,163,927 | 175,894,948 | 206,466,816 | 234,543,106 | 267,514,052 | 300,703,779 |
| <i>Fixed assets</i> | | | | | | | | | | | |
| Land | 2,500,851 | 2,500,851 | 2,500,851 | 2,500,851 | 2,500,851 | 2,500,851 | 2,500,851 | 2,500,851 | 2,500,851 | 2,500,851 | 2,500,851 |
| Building/Infrastructure | 20,548,250 | 19,520,838 | 18,493,425 | 17,466,013 | 16,438,600 | 15,411,188 | 14,383,775 | 13,356,363 | 12,328,950 | 11,301,538 | 10,274,125 |
| Machinery & equipment | 32,081,980 | 28,873,782 | 25,665,584 | 22,457,386 | 19,249,188 | 16,040,990 | 12,832,792 | 9,624,594 | 6,416,396 | 3,208,198 | - |
| Furniture & fixtures | 258,000 | 232,200 | 206,400 | 180,600 | 154,800 | 129,000 | 103,200 | 77,400 | 51,600 | 25,800 | - |
| Office vehicles | 1,919,000 | 1,439,250 | 959,500 | 479,750 | 2,809,608 | 2,107,206 | 1,404,804 | 702,402 | 4,113,547 | 3,085,160 | 2,056,773 |
| Office equipment | 340,000 | 306,000 | 272,000 | 238,000 | 204,000 | 170,000 | 136,000 | 102,000 | 68,000 | 34,000 | - |
| Total Fixed Assets | 57,648,081 | 52,872,921 | 48,097,760 | 43,322,600 | 41,357,047 | 36,359,235 | 31,361,422 | 26,363,610 | 25,479,344 | 20,155,547 | 14,831,750 |
| <i>Intangible assets</i> | | | | | | | | | | | |
| Pre-operation costs | 3,508,000 | 2,806,400 | 2,104,800 | 1,403,200 | 701,600 | - | - | - | - | - | - |
| Legal, licensing, & training costs | 500,000 | 400,000 | 300,000 | 200,000 | 100,000 | - | - | - | - | - | - |
| Total Intangible Assets | 4,008,000 | 3,206,400 | 2,404,800 | 1,603,200 | 801,600 | - | - | - | - | - | - |
| TOTAL ASSETS | 68,097,981 | 92,492,816 | 108,416,551 | 128,202,417 | 152,751,181 | 181,523,162 | 207,256,370 | 232,830,425 | 260,022,450 | 287,669,599 | 315,535,528 |
| Liabilities & Shareholders' Equity | | | | | | | | | | | |
| <i>Current liabilities</i> | | | | | | | | | | | |
| Accounts payable | | 7,653,953 | 9,111,517 | 10,763,184 | 12,632,626 | 14,682,202 | 15,935,490 | 17,302,105 | 18,793,283 | 20,421,520 | 20,224,037 |
| Total Current Liabilities | - | 7,653,953 | 9,111,517 | 10,763,184 | 12,632,626 | 14,682,202 | 15,935,490 | 17,302,105 | 18,793,283 | 20,421,520 | 20,224,037 |
| <i>Other liabilities</i> | | | | | | | | | | | |
| Deferred tax | | 5,580,764 | 5,547,182 | 5,513,599 | 5,480,017 | 5,565,178 | 4,393,141 | 3,221,103 | 2,049,066 | 1,050,882 | (143,974) |
| Total Long Term Liabilities | - | 5,580,764 | 5,547,182 | 5,513,599 | 5,480,017 | 5,565,178 | 4,393,141 | 3,221,103 | 2,049,066 | 1,050,882 | (143,974) |
| <i>Shareholders' equity</i> | | | | | | | | | | | |
| Paid-up capital | 68,097,981 | 68,097,981 | 68,097,981 | 68,097,981 | 68,097,981 | 68,097,981 | 68,097,981 | 68,097,981 | 68,097,981 | 68,097,981 | 68,097,981 |
| Retained earnings | | 11,160,118 | 25,659,871 | 43,827,652 | 66,540,557 | 93,177,800 | 118,829,758 | 144,209,236 | 171,082,119 | 198,099,215 | 227,357,484 |
| Total Equity | 68,097,981 | 79,258,099 | 93,757,853 | 111,925,634 | 134,638,539 | 161,275,781 | 186,927,739 | 212,307,217 | 239,180,101 | 266,197,196 | 295,455,465 |
| TOTAL CAPITAL AND LIABILITIES | 68,097,981 | 92,492,816 | 108,416,551 | 128,202,417 | 152,751,181 | 181,523,162 | 207,256,370 | 232,830,425 | 260,022,450 | 287,669,599 | 315,535,528 |

13.3 Cash Flow Statement

| Calculations | | | | | | | | | | | |
|--|------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|--------------------|--------------------|
| Cash Flow Statement | | | | | | | | | | | |
| | Year 0 | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 | Year 8 | Year 9 | Year 10 |
| <i>Operating activities</i> | | | | | | | | | | | |
| Net profit | | 15,943,025 | 25,496,841 | 36,951,061 | 51,230,286 | 66,570,586 | 76,578,997 | 87,183,436 | 100,193,792 | 111,916,759 | 126,697,190 |
| Add: depreciation expense | | 4,775,161 | 4,775,161 | 4,775,161 | 4,775,161 | 4,997,812 | 4,997,812 | 4,997,812 | 4,997,812 | 5,323,797 | 5,323,797 |
| amortization of pre-operating costs | | 701,600 | 701,600 | 701,600 | 701,600 | 701,600 | - | - | - | - | - |
| amortization of training costs | | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 | - | - | - | - | - |
| Deferred income tax | | 5,580,764 | (33,583) | (33,583) | (33,583) | 85,162 | (1,172,037) | (1,172,037) | (1,172,037) | (998,184) | (1,194,856) |
| Accounts receivable | | (17,447,507) | (1,831,988) | (3,943,137) | (4,538,969) | (5,214,537) | (4,574,859) | (3,755,100) | (4,130,610) | (4,543,671) | (4,998,038) |
| Equipment inventory | (122,008) | (16,349) | (18,540) | (21,024) | (23,841) | (27,036) | (30,659) | (34,767) | (39,426) | (44,709) | 378,361 |
| Raw material inventory | (3,619,843) | (1,024,560) | (1,265,304) | (1,557,799) | (1,912,601) | (1,560,850) | (1,820,575) | (2,123,519) | (2,476,873) | (2,889,024) | 20,250,948 |
| Advance insurance premium | (1,700,049) | 184,397 | 184,397 | 184,397 | 43,917 | 195,530 | 195,530 | 195,530 | (10,147) | 211,829 | 314,668 |
| Accounts payable | | 7,653,953 | 1,457,565 | 1,651,667 | 1,869,442 | 2,049,576 | 1,253,287 | 1,366,615 | 1,491,179 | 1,628,237 | (197,483) |
| Cash provided by operations | (5,441,900) | 16,450,483 | 29,566,149 | 38,808,343 | 52,211,412 | 67,897,844 | 75,427,496 | 86,657,970 | 98,853,690 | 110,605,034 | 146,574,588 |
| <i>Financing activities</i> | | | | | | | | | | | |
| Issuance of shares | 68,097,981 | - | - | - | - | - | - | - | - | - | - |
| Cash provided by / (used for) financing activities | 68,097,981 | - | - | - | - | - | - | - | - | - | - |
| <i>Investing activities</i> | | | | | | | | | | | |
| Capital expenditure | (61,656,081) | - | - | - | (2,809,608) | - | - | - | (4,113,547) | - | - |
| Cash (used for) / provided by investing activities | (61,656,081) | - | - | - | (2,809,608) | - | - | - | (4,113,547) | - | - |
| NET CASH | 1,000,000 | 16,450,483 | 29,566,149 | 38,808,343 | 49,401,804 | 67,897,844 | 75,427,496 | 86,657,970 | 94,740,143 | 110,605,034 | 146,574,588 |
| Cash balance brought forward | | 1,000,000 | 12,667,575 | 31,236,637 | 51,261,700 | 72,146,123 | 100,110,623 | 124,611,081 | 149,465,093 | 170,884,327 | 196,589,698 |
| Cash available for appropriation | 1,000,000 | 17,450,483 | 42,233,724 | 70,044,980 | 100,663,504 | 140,043,966 | 175,538,120 | 211,269,051 | 244,205,236 | 281,489,362 | 343,164,286 |
| Dividend | | 4,782,908 | 10,997,088 | 18,783,280 | 28,517,382 | 39,933,343 | 50,927,039 | 61,803,958 | 73,320,908 | 84,899,663 | 97,438,922 |
| Cash balance | 1,000,000 | 12,667,575 | 31,236,637 | 51,261,700 | 72,146,123 | 100,110,623 | 124,611,081 | 149,465,093 | 170,884,327 | 196,589,698 | 245,725,365 |
| Cash carried forward | 1,000,000 | 12,667,575 | 31,236,637 | 51,261,700 | 72,146,123 | 100,110,623 | 124,611,081 | 149,465,093 | 170,884,327 | 196,589,698 | 245,725,365 |

14 KEY ASSUMPTIONS

| Item | Assumption(s) |
|---|--------------------------------------|
| Business/Sales Increase | 10 % per year |
| Increase in Cost of Elements | 10 % per year |
| Increase in Staff Salaries | 10 % per year |
| Increase in Utilities (Electricity / Water / Gas) | 10 % per year |
| Increase in Office Expenses | 10 % per year |
| Equity: Debt | 100:0 |
| Depreciation | |
| o Construction & Renovation | 05 % per annum (Diminishing Balance) |
| o Plant & Machinery | 10 % per annum (Diminishing Balance) |
| o Furniture & Fixtures | 10 % per annum (Diminishing Balance) |
| o Vehicle | 25 % per annum (Diminishing Balance) |