WEIGHT MACHINES

1. INTRODUCTION:

Weighing scales are devices to measure weight or calculate mass. The balance also known as balance scale or beam balance was the first mass measuring instrument invented. In its traditional form, it consists of a pivoted horizontal lever with arms of equal length – the beam and a weighing pan. Various other types of designs evolved like spring type, mechanical, hydraulic, pneumatic, electronic etc.

Scales and balances are widely used in commerce, as many products are sold and packaged by weight. Weighing machines and systems are also used in industry for producing various food, dairy, agri commodities, chemicals, pharmaceutical etc. processing.

Most countries regulate the design and servicing of scales used for commerce. Government regulation generally requires periodic inspections by licensed technicians using weights whose calibration is traceable to an approved laboratory.

2. PRODUCT & ITS APPLICATION:

Weighing machines are required for many applications, requiring various design parameters e.g. different types, sizes and capacity of weighing machines from table top to large truck weighing weigh bridges. There are various machines available in the market.

Balance Beam Scale:

This most common weighing machine – a balance or pair scales using a traditional beam balance weight measurement equipment essentially compare masses with that of standard weights. In precision balances, a more accurate determination of the mass is given by the position of a sliding mass moved along a graduated scale.

Spring Balance:

Spring balances measure force on spring due to weight. These scales have compact construction and suited to heavy weights.

Hydraulic/ Pneumatic Load Cells:

In hydraulic system or pneumatic load cells, force is applied to a piston moving in an oil/gas filled cylinder. The force due to weight generates pressure that is transmitted through hydraulic lines to a dial indicator based on a Bourdon tube. Because this sensor has no electrical components, it is ideal for use in hazardous areas. This technology is more expensive than other types of load cells.

Electronic Scales:

The electronic weighing system comprises the basic load cell, suitable signal conditioners and output recorders/ indicators giving both the analog and digital output for further processing. The signals from the load cell are amplified and fed to analog/digital converter, which provide an output in the digital format for display/ printing/processing etc. The strain gauge based load cell is the most popular weight transducer used in the electronic weighing system.

The main advantages of an electronic weighing system when compared with mechanical weighing systems are:

- Compactness and small size independent of capacity.
- Ruggedness and high dependability.
- High speed of response and rapid weighing.
- Good accuracy.
- Excellent flexibility to monitor multiple loads.
- Analog and digital with printout facility remote indication and parallel display.
- Online processing through computer.

A **load cell** is a transducer that is used to create an electrical signal whose magnitude is directly proportional to the force being measured. Through a mechanism, the force being sensed is transmitted to load cell that gets loaded/ deformed. The semiconductor thin film

resistor acts as strain gauge. A load cell usually consists of four strain gauges in a Wheatstone bridge configuration to produce electrical signal. The output signal of the transducer can be calibrated and scaled to calculate the force / weight applied to the transducer.

Many systems use piezoelectric load cells that have similar principle of deformation /strain due to load. A voltage output is generated by the basic piezoelectric material – proportional to the deformation of load cell. This type of cell is useful for dynamic loading and frequent measurements of force. Piezo-based load cells are used in the dynamic loading conditions, where strain gauge load cells can fail.

There are several common shapes of strain gauge type load cells to meet the load range, accuracy levels and place and purpose of measurement safety etc. Some are used as safety device viz. Rope clamp, are attached to a rope to measures tension. Rope clamps are popular in hoist, crane and elevator applications. Similarly Load-pin, type load cell is used for sensing loads on wheel axles in rail/ road vehicles.

Weight measurement in Industry requires fast, dynamic and reliable load cells that can give accurate measurement. Some performance characteristics of the load cells must therefore be defined and specified to make sure they will cope with the expected service. They can be installed on hoppers, reactors, etc. and allow controlling the weight in the capacity, which is often of critical importance for an industrial process.

3. DESIRED QUALIFICATIONS FOR PROMOTER:

Any ITI, Diploma or Graduate with some background in manufacturing or marketing.

4. INDUSTRY OUTLOOK/TREND

Weighing equipment are essential instruments and are present everywhere in the commercial and industrial activities for all stages, viz. Procurement, Distribution, transportation, manufacturing, packing, sales and retailing of commodities and finished products. The global weighing machines and equipment market is estimated to be more than US$ 2.0 billion and it

is expected to reach US$ 3.5 billion by 2024. The industrial growth and automation trend in all the industrial and commercial activities around the developing world is the driving force. Asia and particularly India is the fastest growing markets having demand for personal weighing scales and bench scales witnessing the highest growth, with estimated growth rate of more than 8 %. The future driving forces are e-commerce and modernization of retail commercial activities.

The weighing equipment industry in India comprises various large, medium and small companies that manufacture simple scales for health sector to bench and platform scales for retail activities, with and without printers and large weigh bridges as well as continuous weighing in industrial processes and packaging. Large international players such as Avery, Mettler Toledo, ATCO etc. compete with various medium and small companies like Omron, Atom, Crown, Metis, Pesco, Bulfyss etc. in commercial applications, while Weightron, Hindustan Scale co, Techno Weigh India, Eagle Weigh Bridgeetc. are active in industrial systems and weigh bridges.

The trend of availability of low cost load sensors and related electronic components used in electronic weighing scales is a key factor boosting market growth. Advancement in weighing machine technology features automatic loading, accuracy and compact digital circuits, easy to calibrate weighing machines in the industrial market.

5. MARKET POTENTIAL AND MARKETING ISSUES. IF ANY:

The major end users such as Industrial Manufacturing industry is expected to lead the industrial weighing equipment market with a CAGR in range of 3% - 6%. The health scales segment is projected to witness a CAGR of 5.2%, while the gem and jewelry scales segment is expected to be a close second at 5.1%. The retail bench / platform scales segment is expected to be the second largest segment, with a market share of 24.0%.

The market for weighing systems has increased in last decade with an average annual growth of 6.7%. Currently, personal weighing machines and household scales account for 26.0% of the global demand while the remaining market share is divided between scales for continuous

weighing of goods on conveyors (3.8%), constant weight scales for packaging (12.0%), smaller weighing machines - less than 30 kg) (17.9%), weighing machines up to 5000 kg) (14.2%), other large weighing machines / bridges (5.0%) and parts for weighing machines (21.1%).

While leading international players operating in the country dominates the industrial market in India, the large volume of personal healthcare and commercial sector demand us met by S ME sector offering the products. Most of SME units are assemblers of products in standard range of up to 500 kg range that is having more than 75% share by volume. The SME units are growing primarily due to low cost, easy to use and flexible products in high demand in most of work activities. The plants in unorganized sector with proper standard specification and approval process is likely to grow and graduate to medium sector for domestic as well as export market due to advancements and ease of manufacturing in electronic systems.

6. RAW MATERIAL REQUIREMENTS:

Weighing scale of electronic /digital type are considered for project. The main components are load cell, electronic circuit, display unit, weighing pan, weight balancing mechanism and housing. The unit can procure load cells and all electronic components from market, for assembly as per design, while body and pan are produced in house. For housing and pan, raw materials required are plastic molding and steel sheets of various gauges. All the materials are easily available.

7. MANUFACTURING PROCESS:

The manufacturing process mainly consists of assembly.

- Load cells are selected and sourced from reputed manufacturers offering reliability and durability. As per the weighing capacity of final machines, different type and design of load cells are used.
- These load cells are connected with weighing pan through levers to equalize the load.
- Load cell is connected with electronic circuit and display and/ or printer unit. The whole

assembly is mounted in the housing or body of machine.

- The machines are then powered up and the adjustments of load cell are carried out. The circuit adjustments of output are calibrated as per the accuracy range and weighing range specified for machine as per the prescribed process.
- The adjustments are sealed with temper proof seals and certified as calibrated scale.
- These weighing scales are then inspected / checked for accuracy for full range of weights in the range specified for machine before packing and dispatch.

8. MANPOWER REQUIREMENT:

The unit shall require highly skilled service persons. The unit can start from 8 employees initially and increase to 23 or more depending on business volume.

Sr No	Type of Employees	Monthly Salary	No of Employees				
			Year 1	Year 2	Year 3	Year 4	Year 5
1	Skilled Operators	18000	3	3	4	6	6
2	Semi-Skilled/ Helpers	8000	6	8	12	15	15
3	Supervisor/ Manager	25000	1	1	3	3	3
4	Accounts/ Marketing	16000	2	2	2	2	2
5	Other Staff	7000	1	2	2	2	2
	TOTAL		13	16	23	28	28

9. IMPLEMENTATION SCHEDULE:

The unit can be implemented within 6 months from the serious initiation of project work.

Sr No	Activities	Time Required in Months
1	Acquisition of Premises	2
2	Construction (if Applicable)	2
3	Procurement and Installation of Plant and Machinery	2
4	Arrangement of Finance	2
5	Manpower Recruitment and start up	2
	Total Time Required (Activities run concurrently)	6

10. COST OF PROJECT:

The unit will require total project cost of Rs 95.51 lakhs as shown below:

Sr No	Particulars	In Lakhs
1	Land	10.00
2	Building	25.00
3	Plant and Machinery	16.92
4	Fixtures and Electrical Installation	1.60
5	*Other Assets/ Preliminary and Preoperative Expenses*	1.00
6	Margin for working Capital	40.99
	TOTAL PROJECT COST	95.51

11. MEANS OF FINANCE:

The project will require promoter to invest about Rs 54.62 lakhs and seek bank loans of Rs 40.89 lakhs based on 70% loan on fixed assets.

Sr No	Particulars	In Lakhs
1	Promoters Contribution	54.62
2	Loan Finance	40.89
	TOTAL:	95.51

12. WORKING CAPITAL REQUIREMENTS:

Working capital requirements are calculated as below:

Sr No	Particulars	Gross Amount	Margin %	Margin Amount	Bank Finance
1	Inventories	40.09	40	16.04	24.06
2	Receivables	28.52	40	11.41	17.11
3	Overheads	2.85	100	2.85	0.00
4	Creditors	26.73	40	10.69	16.04
	TOTAL	98.20		40.99	57.21

13. LIST OF MACHINERY REQUIRED:

Sr No	Particulars	UOM	Quantity	Rate	Total Value
	Main Machines/ Equipment				
1	Incoming Inspection unit	Nos	1	25000	25000
2	Load cell testing Station	Nos	1	40000	40000
3	Circuit Component Assembly	Nos	1	60000	60000
4	PCB Test Station	Nos	1	30000	30000
5	Load cell circuit assembly and testing	Nos	1	65000	65000
6	Assembly line for PCB	Nos	1	35000	35000
7	Weighing pan mechanism Station	Nos	1	75000	75000
8	Display and printer mounting	Nos	1	15000	15000
9	Assembly Line of Final product	Nos	1	30000	30000
10	Calibration testing of Scales	Nos	1	150000	150000
11	Packing Labeling Station	Nos	1	40000	40000
12	Oscilloscope single/ dual waves	Nos	1	130000	130000
13	Manual Shear machines	Nos	1	12000	12000
14	Sheet bending machine		2	75000	150000
15	Power press	LS	2	25000	50000
16	Curling machine	Nos	1	100000	100000
17	Sand Blasting Station	Nos	1	75000	75000
17	Spray/ Powder painting Plant	Nos	1	250000	250000
18	Buffing/ Polishing machine	Nos	2	25000	50000
19	DC power supply	Nos	2	40000	80000
20	Final Product test and calibration Unit	Nos	1	40000	40000
	Tools and Ancillaries				
1	Jigs Fixture Tools for Assly line etc.	LS	1	150000	150000
2	Hand Tools and gauges	LS	1	40000	40000

Sr No	Particulars	UOM	Quantity	Rate	Total Value
	Fixtures and Elect Installation				
	Storage and transport bins and trolleys	LS	1	60000	60000
	Office Furniture	LS	1	20000	20000
	Telephones/ Computer	LS	1	30000	30000
	Electrical Installation	LS	1	50000	50000
	Other Assets/ Preliminary and Preoperative Expenses	LS	1	100000	100000
	TOTAL PLANT MACHINERY COST				1952000

All the machines and equipment are available from local manufacturers. The entrepreneur needs to ensure proper selection of product mix and proper type of dies and tooling to have modern and flexible designs. It may be worthwhile to look at reconditioned imported machines, dies and tooling. Some of the machinery and dies and tooling suppliers are listed here below:

1. Machineries and Spares
   Ranjit Chawla (Director)201,
   Karmastambh, LBS Marg, Vikhroli West
   Mumbai - 400083, Maharashtra, India

2. Pacific Engineering Corporation
   A-297, MIDC-Mahape, Near Mahape Bus Depot,
   Anthony Garage, Thane-Belapur Road,
   Mahape Midc,
   Navi Mumbai-400710, Maharashtra, India

3. Face Automation
   D215A, Ghatkopar Industrial Estate,
   Agra Road Industrial Premises Co Operative Society Limited,
   LBS Marg, Ghatkopar West, Mumbai- 400086, Maharashtra, India

4. Omega Weld Rod System
   No. 1/455-G, Aachankulam Road Neelambur
   Coimbatore- 641062, Tamil Nadu, India

5. Shree Krishna Pharma Machinery
   No. 2, Vinayak Estate, Near Pharmatech,
   Changodhar, Changodar,
   Ahmedabad-382213, Gujarat, India

14. PROFITABILITY CALCULATIONS:

Sr No	Particulars	UOM	Year Wise estimates				
			Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**
1	Capacity Utilization	%	30	40	50	60	70
2	Sales	Rs. Lakhs	342.30	456.40	570.50	684.60	798.70
3	Raw Materials & Other Direct Inputs	Rs. Lakhs	320.75	427.67	534.59	641.50	748.42
4	Gross Margin	Rs. Lakhs	21.55	28.73	35.91	43.10	50.28
5	Overheads Except Interest	Rs. Lakhs	11.36	11.36	11.36	11.36	11.36
6	Interest	Rs. Lakhs	5.72	5.72	5.72	5.72	5.72
7	Depreciation	Rs. Lakhs	4.45	4.45	4.45	4.45	4.45
8	Net Profit Before Tax	Rs. Lakhs	0.01	7.20	14.38	21.56	28.74

The basis of profitability calculation:

The Unit will have capacity of 15000 nos per year of weighing machines of different types/ ratings mostly of bench top and platform type with / without printer/ data logger. Depending size/ type/ ratings the bulk sale/ distribution sales prices ranges from Rs 5000 per unit to Rs 40000 per unit for commercial /industrial use. For granular/liquid pouch packaging machines continuous weighing type price ranges from Rs 60,000 per unit to Rs 5, 00,000 depending on type, size/ rating and volumes.

The raw material cost of load cells ranges from 300 to 15000 per unit for commercial accuracy, while that of higherprecision and quick response time load cell prices range from Rs 15000 to 75000 per unit. Other materials like digital circuit units with without digital display and with/ without printer etc. costs Rs 700 to Rs 50000. The material requirements are considered with wastage/ scrap etc. of 1 % of finished products. The unusable scrap is sold at @ Rs 18 ~ 50 per Kg. and the income of same is added. Energy Costs are considered at Rs 7 per Kwh and fuel cost is considered at Rs. 65 per liter. The depreciation of plant is taken at 10 % and Interest costs are taken at 14 -15 % depending on type of industry.

15. BREAK EVEN ANALYSIS:

The project is can reach break-even capacity at 29.98 % of the installed capacity as depicted here below:

Sr No	Particulars	UOM	Value
1	Sales at Full Capacity	Rs. Lakhs	1141.00
2	Variable Costs	Rs. Lakhs	1069.17
3	Fixed Cost incl. Interest	Rs. Lakhs	21.53
4	Break Even Capacity	% of Inst Capacity	29.98

16. STATUTORY / GOVERNMENT APPROVALS

The unit shall have to get state industrial unit registration from DIC, IEC Code for Export and local authority clearance. Depending on structure of finance the company shall need to register company with registrar of companies. The registration and approval for factory plan, safety for Fire etc. requirement, registration as per Labour laws ESI, PF etc. shall be required as per rules and applicability. Before starting the unit will also need GST registration for procurement of materials as also for sale of goods. As such there is no pollution control registration requirements, except installation of chimney/ blowers for heat treatment furnace/ painting/ pickling line and ensure safe environment as per rules of factory safety. Solid waste disposal shall have to meet the required norms.Entrepreneur may contact State Pollution Control Board where ever it is applicable.

17. BACKWARD AND FORWARD INTEGRATION

The machines and equipment offer scope for diversification in to producing other electronic instruments and its hosing/ sheet metal parts. The range of products may include import substitution of certain parts. The unit can also of other consumer and industrial products / components etc. by using the spare capacities and machine capabilities. As such there is not much scope for organic backward or forward integration.

18. TRAINING CENTERS/COURSES

There are no specific training centers for wire drawing technology. There are training for dies and tools development run by several centers of excellence viz Indo German Tool Room at Ahmedabad, Rajkot, Chennai, and CTTC Bhubaneswaretc. shall be helpful.

The most important scope of learning is in new product design and development by associating with institutes like NID etc. Entrepreneur may also study the new product designs, product range, features and specifications of leading Brands / competitors across the world by scanning the Internet and downloading data. Viz. North American, Europe, China etc. markets.

Udyamimitra portal (link : www.udyamimitra.in) can also be accessed for hand-holding services viz. application filling / project report preparation, EDP, financial Training, Skill Development, mentoring etc.

Entrepreneurship program helps to run business successfully is also available from Institutes like Entrepreneurship Development Institute of India (EDII) and its affiliates all over India.

Disclaimer:

Only few machine manufacturers are mentioned in the profile, although many machine manufacturers are available in the market. The addresses given for machinery manufacturers have been taken from reliable sources, to the best of knowledge and contacts. However, no responsibility is admitted, in case any inadvertent error or incorrectness is noticed therein. Further the same have been given by way of information only and do not carry any recommendation.