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"Analysis and Improvement of Inventory Activities in pump Manufacturing Industry"

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ABSTRACT:
The purpose of this paper is to analyse the challenges faced in the manufacturing process within the industry. The study aims to investigate the entire production process and identify the primary factors that contribute to decreased efficiency and increased expenses. The methodology utilized for this study includes unstructured interviews, on-site observations, process analysis, and annual report review. Various factors impact the industry in different ways, leading to losses that could cause business failure if not managed effectively. Therefore, the primary objective of this report is to identify these factors and recommend measures for improvement.
In any organization, the inventory of materials represents a significant portion of current assets and working capital. Therefore, this study will also examine the inventory management process and identify the factors that contribute to increased expenses in the industry.
The ultimate goal of this research is to provide practical guidelines for industrialists to ensure that products are available in the right quantity and at the right time.
Keywords — Inventory Management, Manufacturing Industry, Safety Stock, Profit.

I. INTRODUCTION

By effectively driving sales and reducing unnecessary costs competitors are keeping ahead in today's uncertain economy. By having an appropriate inventory control & management plan SMEs can stand a chance in today's environment. Inventory management has prominence not only in retail stores but also in industries. Maintaining inventory in the right quantity is necessary for any company dealing with physical products, including manufacturers, wholesalers, and retailers. SMEs frequently face two occurring problems namely stock-out and overstock. This leads to failure in maintaining product availability at the lowest possible inventory cost. Customer satisfaction is affected by the lack of product availability which is the driving force behind any business. Proper inventory control techniques help to overcome these problems [1].

Inventory is a detailed list of those movable items which are necessary to manufacture a product and to maintain the equipment and machinery input working order.

Inventory is an asset that is owned by a business that has the express purpose of being sold to customer. Inventory refers to the stockpile of the product a firm is offering for sale and the components that make up the product [2]. In inventory management, goods are delivered in the receiving area of a warehouse typically, in the form of raw materials or components and are put into stock areas or onto shelves. Compared to larger organizations with more physical space, in smaller companies, the goods may go directly to the stock area instead of a receiving location. Unfinished goods are then pulled from the stock areas and moved to production facilities where they are made into finished goods. The finished goods may be returned to stock areas where they are held prior to shipment, or they may be shipped directly to customers. Inventory management uses a variety of data to keep track of the goods as they move through the process, including lot numbers, serial numbers, cost of goods, quantity of goods and the dates when they move through the process.

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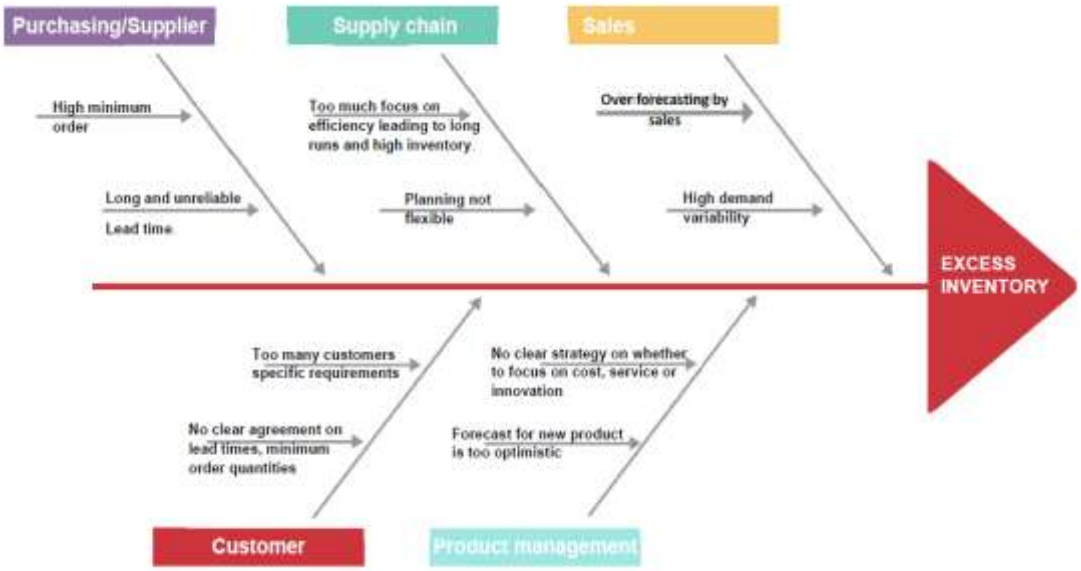
PROBLEM IDENTIFICATION



As Sri Balaji Engineering Works is a small-scale industry thus have no proper inventory control as shown in the cause-and-effect diagram above, in a manufacturing activity, inventories control plays an important role in ensuring the smooth running of a company. The world market forced all organizations to compete not only in price or quality, but also in technology, innovation, reliability, and information technology. Good inventory control can not only save costs but also helps the organization to serve the demand of their customers quickly and efficiently. Inventories represent investment designed to assist in production activities and/or serve customers, without any doubt, inadequate supply of inventories may grind manufacturing operations into a halt. Hence, inventory should be controlled to ensure smooth running of an industry.

II. RESEARCH METHODOLOGY

This paper is a case study of three different inventory control techniques for efficient inventory management system of a Manufacturing company. Although there are several control techniques for maintaining proper inventory management, here three different control techniques are applied which are discussed below.

A. ABC Analysis

ABC analysis is a business term used to define an inventory categorization technique often used in materials management. It is also known as 'Selective Inventory Control.' ABC analysis provides a mechanism for identifying items which will have a significant impact on overall inventory cost whilst also providing a mechanism for identifying different categories of stock that will require different management and controls. When carrying out an ABC analysis, inventory items are valued (item cost multiplied by quantity issued/consumed in period) with the results then ranked. The results are then grouped typically into three bands. These bands are called ABC codes.

ABC CODES

"A class" inventory will typically contain items that account for 80% of total value, or 20% of total items.

"B class" inventory will have around 15% of total value, or 30% of total items.

"C class" inventory will account for the remaining 5%, or 50% of total items. ABC Analysis is similar to the Pareto principle in that the "A class" group will typically account for a large proportion of the overall value but a small percentage of the overall volume of inventory.

ABC classification scheme is calculated as follows:

Annual Consumption=Annual Demand x Unit value

B. Safety Stock

Safety stock is the stock held by a company in excess of its requirement for the lead time. Companies hold safety stock to guard against stock-out. As demand is uncertain, safety stock

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(SS) plays a vital role to satisfy demand if it exceeds the anticipated demand. Too much safety stock carried increases the holding cost of a supply chain. So, the key to the success of any supply chain is to make a balance between safety stock and level of customer satisfaction. Considering demand is constant, safety stock is calculated using the following formula:

$SS = Z \times D \times \sigma L$

where, D = Demand per year (units)
Z = Standard Normal Value
σL = Standard deviation of Lead Time [2].

C. Economical Order Quantity (EOQ)

In inventory management, two important costs are ordering costs incurred on communicating the order and holding cost required for carrying inventories. To minimize carrying cost, items should be ordered frequently in small lots which will in turn increase the ordering cost. As these two costs are opposite, an innovative model is required to make a balance between them. To minimize the total inventory cost, economic order quantity (EOQ) model helps the managers. It defines the optimum quantity that minimizes the total cost (both ordering & holding costs) of stocked material. Economic order quantity (EOQ) & order frequency are calculated by using following formula:

Where,
D = Demand per year (units)
S = Re-order cost/ Procurement cost
H = Carrying or holding cost/ unit/ year
n = D/EOQ
EOQ = sqrt(2DH/s)
EOQ = Economic order quantity [2]
EOQ is essentially an accounting formula that determines the point at which the combination of order costs and inventory carrying costs are the least. The result is the most cost-effective quantity to order. In purchasing this is known as the order quantity, in manufacturing it is known as the production lot size.

HML analysis

The High, medium and Low (HML) classification follows the same procedure as is adopted in ABC classification. Only difference is that in HML, the classification unit value is the criterion and not the annual consumption value. The items of inventory should be listed in the descending order of unit value and it is up to the management to fix limits for three categories.

The HML analysis is useful for keeping control over consumption at departmental levels, for deciding the frequency of physical verification, and for controlling purchases.

When the objective is to keep control over consumption at the department level then authorization to draw materials from the stores will be given to senior staff for H item, next lower level in seniority for M class item and junior level staff for L class items. Cycle counting can also be planned based on HML analysis. H class items shall be counted very frequently, M class shall be counted at lesser frequency and L class shall be counted at least frequency as compared to H & M class.

E. Inventory turnover ratio

The inventory turnover ratio is the number of times a company has sold and replenished its inventory over a specific amount of time. The formula can also be used to calculate the number of days it will take to sell the inventory on hand. The turnover ratio is derived from a mathematical calculation, where the cost of goods sold is divided by the average inventory for the same period. A higher ratio is more desirable than a low one as a high ratio tends to point to strong sales. Knowing your turnover ratio depends on effective inventory control, also known as stock control, where the company has good insight into what it has on hand.

D. Inventory Turnover Ratio =

Cost of Goods Sold / Avg. Inventory

Average inventory=

(Beginning inventory + ending inventory) / 2

III. CALCULATIONS

Necessary data for this study were collected from Orbit Pumps pvt ltd. Some data were collected by Interaction with personnel of the retail shop and direct observation and the remaining data were collected from turnover statements, monthly inventory statements and record file.

SR NO.	ITEM NAME	DEMAND	UNIT PRICE

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1	Long Shaft	198	3,172.00
2	M.S.Bolt	4,060.00	110
3	SS 316 Cup Small	175	864.5
4	76 X 60 CL	45	3,250.00
5	SS 316 Cup 123	150	798.5
6	SS 316 Cup Big	145	812
7	126 X 63 X55 CL	631.5	165
8	PTFE (DRG)	481	203.5
9	SS 316 Cup Medium	120	799.67
10	Size :-1.000"	475	200

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11	Trex 1000ml Vaccum Bottle	155	561
12	80 Std (264/28)Om	230	295.33
13	Skf 6204.ZZ	707	94.5
14	Turbine Blower	2	32,000.00
15	CFT (Sample)	35	1,800.00
16	For Side Jigs	5	12,200.00
17	Big Cantak	275	215
18	S.S. Shafting	770	75
19	SKF 6205.ZZ	409	132
20	C.I Casting	152	342.78

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21	Two Bone Side	10	5,000.00
22	SIZE : 1.250"	212	225
23	Wooden Box (Peti)	35	1,236.00
24	126 X 63 X55 CL	260.5	165
25	SIZE :- 38*26*31*11 mm	400	100
26	Sr Ubha Dabba 19	91	437.5
27	Patti with Wires	315	125
28	HINDUSTAN 3 HP FOOT CUM FLANGE	3	12,781.00
29	90s Std (288/32) Om	110	334
30	Bellow 25 mm Dia Mg1 - NeopSpl	397	90

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31	140 X 76 X 90 CLS	207	165
32	126 x 77 x 75 CL	201.4	165
33	SIZE : 1.250" (Antico)	60	550
34	PTFE Step Ring	204	147
35	Metal Covers(Couls)	400	70.5
36	Electric Motor	3	9,261.00
37	140 X 76 X 90 CLS	165.6	165
38	80 Std (264/28)	91	283
39	Painting Jigs	10	2,500.00
40	Spring Two Bone Side	5	5,000.00

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41	SIZE :- 50.10 x 33 x 45 x 11.3 mm	156	160
42	P.P Filter 12" Plate Without Pump	2	12,000.00
43	Small Contak	215	110
44	S.S Grab Screw - 5/16-1/2	4,600.00	5
45	JPP 120-PP SEAL TYPE PUMP	2	11,500.00
46	140 x 76 x 60 CL	138	165
47	90 C 175 mm	190	105.4
48	JPP 100-PP SEAL TYPE PUMP	2	10,000.00
49	80 Std (266/28) Om	58	334
50	5/16 - 1" Inch Bolt	1,500.00	12.22

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51	90s Std (287/32)	54	334
52	80.C 158 mm	241	74.42
53	90 Body Std	68	250
54	Casting Small	185	90
55	63 x 25 x 55 CL	200	83.12
56	S.S Grab Screw - 5/16-1/2	1,500.00	11
57	Crompton 3PH Electric Motor	2	8,011.00
58	Metal Feminal Block	626	24.4
59	S.S 304	2,075.00	7.19
60	5/16 - 2.1/2 Bolt	1,500.00	9.93

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61	PP ROD	49	301.67
62	AP DECO 101 GLOSSY BLUES	48	285
63	SIZE :- 45.10*27*36*11.30mm	100	130
64	12" Filter 26 Plate 2.0 Hp	1	13,000.00
65	C.I.Self Priming Pump	1	12,900.00
66	12" Filter 22 Plate 2.0 Hp	1	12,500.00
67	5/16 - 2.1/2 Bolt	1,000.00	12
68	12" Filter 18 Plate 1.0 Hp	1	12,000.00
69	5/16 - 3" Inch Bolt	1,000.00	11.4
70	3/8 - 4" Inch Bolt	500	21.36

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71	10" Filter 18 Pad 1.0 Hp	1	10,500.00
72	Blue Star Plat Form Scale 500kg	1	10,500.00
73	Magnet Pump MP 30 - PH	2	5,016.00
74	HYLEM GLAND PLATE AS PER DRG	50	200
75	Mixer Grinders	4	2,457.67
76	Fan Vergin	275	31.23
77	71 Std (239/22)	31	268
78	Pew 1hp 1ph Pump Smb10	1	8,303.57
79	Bearing Housing3	2	4,100.00
80	SIZE :- 140*51*23mm	35	225

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81	90 Frame S/L Body Base Hole Drill Jig	1	7,750.00
82	80 Body Std	66	112
83	Vifon Cordon O, Ring - 47.65 x 3.5	560	13
84	Oil Seal 20*35*7	382	19
85	3/8 - 1" Inch Bolt	500	14.25
86	Kulhad Glass	15	464.3
87	80 Cover	126	52
88	80 Frame Body Base Hole Drill Jig	1	6,400.00
89	5/16 - 1.1/4 Bolt	1,000.00	6.32
90	N.F. O,Ring - 195 x 3.5	143	40

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91	Allen Cap 5x35mm	3,000.00	1.85
92	71 Frame Body Base Hole Drill Jig	1	5,500.00
93	Key & Nuts	17	310
94	CFT (DRG)	70	75
95	71 Body Std	46	112
96	3/8 - 2" Inch Bolt	300	15.6
97	Filter Repair Handle Cat Ring Welding	2	2,200.00
98	90 F 24 Vergin	136	32.2
99	Oil Seal 25*40*7	150	28
100	77 X 75 CL	38	110

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101	Vifon Cordon O'ring 38 x 3.5	315	13
102	90S Spl (290/32) Om	10	407
103	5/16 - Nuts	2,000.00	2.02
104	Alu Anodized Label	1,152.00	3.5
105	Socket Head Cap Screw	1,000.00	4
106	Plastic Box 85*85	170	23.3
107	Shaft 102 mm	149	26
108	S S 316	200	18.76
109	63 X 55 CL	50	75
110	BACK PLATE	2	1,800.00

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111	1 1/8 UT-TB FACE GFT ROTARY	2	1,800.00
112	80 E/S	66	52
113	SIZE :- 1.375" (Antico)	10	341.67
114	2.5-5 SQMM RING TYPE LUGS 3D - 1304	2,000.00	1.67
115	71 Covers	50	66.6
116	Metal Couls.72*72	80	40.2
117	76 X 90 CL	25	125
118	76 X 60 CL	25	125
119	PTFE RINGS	47	66
120	71 Flange	45	68

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121	N.F. O,Ring - 105 x 3.5	210	14.5
122	1/4 - 2" Inch Bolt	500	6.05
123	1.000 UT-TB FACE GFT ROTARY	4	750
124	Socket Head Cap Screw	1,000.00	3
125	Spring Holder Contak	13	230
126	90 Flange	32	90
127	CI Bearing Cover	4	720
128	Cortis Filter Stand Height & Setting	1	2,800.00
129	40 / 45 Block	409	6.5
130	SIZE :- 1.125" (Antico)	5	525

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131	NACHI 6205.ZZ	26	100
132	1/4 - 1.5" Inch Bolt	500	5
133	Mechanical Seal	1	2,500.00
134	S.S 316 Bolt 3/8*1"	200	12.47
135	Plastic Box	120	20.2
136	FLV - CHR - 1095	1	2,330.52
137	80 F Fan 19 Bore	75	28.8
138	Paid Big	327	6.5
139	80 Std (268/28) Om	46	46
140	1.000 CERAMIC SLEEVE 24.96*15*110	4	500

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141	1 1/4 T TYPE CERAMIC 63.5x33x50.8x27	2	1,000.00
142	1 1/8 ANTICO T TYPE CERAMIC 59*30.50*46*27	4	475
143	1/4 - 1.1/4 Bolt	500	3.65
144	Size;- 45.3*22.10*12.25 mm	4	450
145	90 F 24 Vergin	50	34.4
146	Oil Seal 17*30*7	100	17
147	PVC Sticker	1,206.00	1.4
148	3/8 Washer	2,000.00	0.84
149	1.000,T TYPE CERAMIC 53*26.5*42.5*18	4	400
150	P P Back Plate for Alfa - 100 CT	2	790.5

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151	Filter Motor Changed Magnetic	1	1,500.00
152	SKF 6207 ZZ	4	360
153	Fan 15 Bore	50	26.6
154	90L XXL (430/32) Om	2	650
155	Brown Tape	36	35
156	Cello Tape	36	35
157	Strech Film Roll	5	250
158	5/16 Washer	2,000.00	0.6
159	HSS Tap Set - IT - 3/8" Bsw	1	800
160	M.S.Machine Screw	2,000.00	0.38
161	Feminal Box in High Quality	40	18.8

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162	SKF 6206 ZZ	2	370
163	EN - 8 Bare Shaft	1	685
164	3/8 - SQ	3,000.00	0.21
165	SKF 6308.ZZ	1	630
166	1/4 Washer	1,500.00	0.42
167	12" Cloth Filter	24	25
168	12" Kapda	22	25
169	N.F. O,Ring - 14 x 3.5	103	5
170	6 MM SQ	5,000.00	0.1
171	Bearing No. 5205	1	500

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172	Shaft Milling	19	25
173	5 MM - SQ	5,000.00	0.09
174	S.S 202	500	0.8
175	Filter Rubber Oring	2	200
176	Copier Paper	2	195
177	S.S 202	500	0.6
178	Tissu Napkins	10	28

IV. COMPUTATIONAL STEPS

❖ **ABC Analysis**

For classifying items into A, B and C category, we first calculated annual usage of each item by finding product of unit cost and demand of each item. Items are then arranged in descending order according to annual usage. After that percentage annual usage along with percentage cumulative usage of each item is obtained and all items are then classified in to respective A, B, and C category following ABC classification method

SR NO.	ITEM NAME	DEMAND	UNIT PRICE	ANNUAL USAGE	% ANNUAL USAGE	% CUMULATIVE ANNUAL USAGE	CLASSIFICATION CATEGORY

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1	Long Shaft	198	3,172.00	628056	14.882	14.882	A
2	M.S.Bolt	4,060.00	110	446600	10.582	25.464	A
3	SS 316 Cup Small	175	864.5	151287.5	3.585	29.049	A
4	76 X 60 CL	45	3,250.00	146250	3.465	32.515	A
5	SS 316 Cup 123	150	798.5	119775	2.838	35.353	A
6	SS 316 Cup Big	145	812	117740	2.790	38.143	A
7	126 X 63 X55 CL	631.5	165	104197.5	2.469	40.612	A
8	PTFE (DRG)	481	203.5	97883.5	2.319	42.931	A
9	SS 316 Cup Medium	120	799.67	95960.4	2.274	45.205	A
10	Size :-1.000"	475	200	95000	2.251	47.456	A
11	Trex 1000ml Vaccum Bottle	155	561	86955	2.060	49.516	A
12	80 Std (264/28)Om	230	295.33	67925.9	1.610	51.126	A
13	Skf 6204.ZZ	707	94.5	66811.5	1.583	52.709	A
14	Turbine Blower	2	32,000.00	64000	1.516	54.225	A
15	CFT (Sample)	35	1,800.00	63000	1.493	55.718	A
16	For Side Jigs	5	12,200.00	61000	1.445	57.164	A
17	Big Cantak	275	215	59125	1.401	58.565	A

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18	S.S. Shafting	770	75	57750	1.368	59.933	A
19	SKF 6205.ZZ	409	132	53988	1.279	61.212	A
20	C.I Casting	152	342.78	52102.56	1.235	62.447	A
21	Two Bone Side	10	5,000.00	50000	1.185	63.632	A
22	SIZE : 1.250"	212	225	47700	1.130	64.762	A
23	Wooden Box (Peti)	35	1,236.00	43260	1.025	65.787	A
24	126 X 63 X55 CL	260.5	165	42982.5	1.018	66.805	A
25	SIZE :- 38*26*31*11 mm	400	100	40000	0.948	67.753	A
26	Sr Ubha Dabba 19	91	437.5	39812.5	0.943	68.697	A
27	Patti with Wires	315	125	39375	0.933	69.630	A
28	HINDUSTAN 3 HP FOOT CUM FLANGE	3	12,781.00	38343	0.909	70.538	A
29	90s Std (288/32) Om	110	334	36740	0.871	71.409	B
30	Bellow 25 mm Dia Mg1 - NeopSpl	397	90	35730	0.847	72.255	B
31	140 X 76 X 90 CLS	207	165	34155	0.809	73.065	B
32	126 x 77 x 75 CL	201.4	165	33231	0.787	73.852	B
33	SIZE : 1.250" (Antico)	60	550	33000	0.782	74.634	B

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34	PTFE Step Ring	204	147	29988	0.711	75.345	B
35	Metal Covers(Couls)	400	70.5	28200	0.668	76.013	B
36	Electric Motor	3	9,261.00	27783	0.658	76.671	B
37	140 X 76 X 90 CLS	165.6	165	27324	0.647	77.319	B
38	80 Std (264/28)	91	283	25753	0.610	77.929	B
39	Painting Jigs	10	2,500.00	25000	0.592	78.521	B
40	Spring Two Bone Side	5	5,000.00	25000	0.592	79.114	B
41	SIZE :- 50.10 x 33 x 45 x 11.3 mm	156	160	24960	0.591	79.705	B
42	P.P Filter 12" Plate Without Pump	2	12,000.00	24000	0.569	80.274	B
43	Small Contak	215	110	23650	0.560	80.834	B
44	S.S Grab Screw - 5/16-1/2	4,600.00	5	23000	0.545	81.379	B
45	JPP 120-PP SEAL TYPE PUMP	2	11,500.00	23000	0.545	81.924	B
46	140 x 76 x 60 CL	138	165	22770	0.540	82.464	B
47	90 C 175 mm	190	105.4	20026	0.475	82.938	B
48	JPP 100-PP SEAL TYPE PUMP	2	10,000.00	20000	0.474	83.412	B
49	80 Std (266/28) Om	58	334	19372	0.459	83.871	B

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50	5/16 - 1" Inch Bolt	1,500.00	12.22	18330	0.434	84.305	B
51	90s Std (287/32)	54	334	18036	0.427	84.733	B
52	80.C 158 mm	241	74.42	17935.22	0.425	85.158	B
53	90 Body Std	68	250	17000	0.403	85.561	B
54	Casting Small	185	90	16650	0.395	85.955	B
55	63 x 25 x 55 CL	200	83.12	16624	0.394	86.349	B
56	S.S Grab Screw - 5/16-1/2	1,500.00	11	16500	0.391	86.740	B
57	Crompton 3PH Electric Motor	2	8,011.00	16022	0.380	87.120	B
58	Metal Feminal Block	626	24.4	15274.4	0.362	87.481	B
59	S.S 304	2,075.00	7.19	14919.25	0.354	87.835	B
60	5/16 - 2.1/2 Bolt	1,500.00	9.93	14895	0.353	88.188	B
61	PP ROD	49	301.67	14781.83	0.350	88.538	B
62	AP DECO 101 GLOSSY BLUES	48	285	13680	0.324	88.862	B
63	SIZE :- 45.10*27*36 *11.30mm	100	130	13000	0.308	89.170	B
64	12" Filter 26 Plate 2.0 Hp	1	13,000.00	13000	0.308	89.478	B

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65	C.I.Self Priming Pump	1	12,900.00	12900	0.306	89.784	B
66	12" Filter 22 Plate 2.0 Hp	1	12,500.00	12500	0.296	90.080	B
67	5/16 - 2.1/2 Bolt	1,000.00	12	12000	0.284	90.365	B
68	12" Filter 18 Plate 1.0 Hp	1	12,000.00	12000	0.284	90.649	B
69	5/16 - 3" Inch Bolt	1,000.00	11.4	11400	0.270	90.919	B
70	3/8 - 4" Inch Bolt	500	21.36	10680	0.253	91.172	C
71	10" Filter 18 Pad 1.0 Hp	1	10,500.00	10500	0.249	91.421	C
72	Blue Star Plat Form Scale 500kg	1	10,500.00	10500	0.249	91.670	C
73	Magnet Pump MP 30 - PH	2	5,016.00	10032	0.238	91.907	C
74	HYLEM GLAND PLATE AS PER DRG	50	200	10000	0.237	92.144	C
75	Mixer Grinders	4	2,457.67	9830.68	0.233	92.377	C
76	Fan Vergin	275	31.23	8588.25	0.204	92.581	C
77	71 Std (239/22)	31	268	8308	0.197	92.778	C
78	Pew 1hp 1ph Pump Smb10	1	8,303.57	8303.57	0.197	92.975	C
79	Bearing Housing3	2	4,100.00	8200	0.194	93.169	C

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80	SIZE :- 140*51*23mm	35	225	7875	0.187	93.355	C
81	90 Frame S/L Body Base Hole Drill Jig	1	7,750.00	7750	0.184	93.539	C
82	80 Body Std	66	112	7392	0.175	93.714	C
83	Vifon Cordon O, Ring - 47.65 x 3.5	560	13	7280	0.173	93.887	C
84	Oil Seal 20*35*7	382	19	7258	0.172	94.059	C
85	3/8 - 1" Inch Bolt	500	14.25	7125	0.169	94.228	C
86	Kulhad Glass	15	464.3	6964.5	0.165	94.393	C
87	80 Cover	126	52	6552	0.155	94.548	C
88	80 Frame Body Base Hole Drill Jig	1	6,400.00	6400	0.152	94.699	C
89	5/16 - 1.1/4 Bolt	1,000.00	6.32	6320	0.150	94.849	C
90	N.F. O,Ring - 195 x 3.5	143	40	5720	0.136	94.985	C
91	Allen Cap 5x35mm	3,000.00	1.85	5550	0.132	95.116	C
92	71 Frame Body Base Hole Drill Jig	1	5,500.00	5500	0.130	95.247	C
93	Key & Nuts	17	310	5270	0.125	95.371	C
94	CFT (DRG)	70	75	5250	0.124	95.496	C
95	71 Body Std	46	112	5152	0.122	95.618	C

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96	3/8 - 2" Inch Bolt	300	15.6	4680	0.111	95.729	C
97	Filter Repair Handle Cat Ring Welding	2	2,200.00	4400	0.104	95.833	C
98	90 F 24 Vergin	136	32.2	4379.2	0.104	95.937	C
99	Oil Seal 25*40*7	150	28	4200	0.100	96.036	C
100	77 X 75 CL	38	110	4180	0.099	96.135	C
101	Vifon Cordon O'ring 38 x 3.5	315	13	4095	0.097	96.232	C
102	90S Spl (290/32) Om	10	407	4070	0.096	96.329	C
103	5/16 - Nuts	2,000.00	2.02	4040	0.096	96.425	C
104	Alu Anodized Label	1,152.00	3.5	4032	0.096	96.520	C
105	Socket Head Cap Screw	1,000.00	4	4000	0.095	96.615	C
106	Plastic Box 85*85	170	23.3	3961	0.094	96.709	C
107	Shaft 102 mm	149	26	3874	0.092	96.801	C
108	S S 316	200	18.76	3752	0.089	96.889	C
109	63 X 55 CL	50	75	3750	0.089	96.978	C
110	BACK PLATE	2	1,800.00	3600	0.085	97.064	C
111	1 1/8 UT-TB FACE GFT ROTARY	2	1,800.00	3600	0.085	97.149	C

112	80 E/S	66	52	3432	0.081	97.230	C
113	SIZE :- 1.375" (Antico)	10	341.67	3416.7	0.081	97.311	C
114	2.5-5 SQMM RING TYPE LUGS 3D - 1304	2,000.00	1.67	3340	0.079	97.390	C
115	71 Covers	50	66.6	3330	0.079	97.469	C
116	Metal Couls.72*72	80	40.2	3216	0.076	97.545	C
117	76 X 90 CL	25	125	3125	0.074	97.620	C
118	76 X 60 CL	25	125	3125	0.074	97.694	C
119	PTFE RINGS	47	66	3102	0.074	97.767	C
120	71 Flange	45	68	3060	0.073	97.840	C
121	N.F. O,Ring - 105 x 3.5	210	14.5	3045	0.072	97.912	C
122	1/4 - 2" Inch Bolt	500	6.05	3025	0.072	97.983	C
123	1.000 UT-TB FACE GFT ROTARY	4	750	3000	0.071	98.054	C
124	Socket Head Cap Screw	1,000.00	3	3000	0.071	98.126	C
125	Spring Holder Contak	13	230	2990	0.071	98.196	C
126	90 Flange	32	90	2880	0.068	98.265	C
127	CI Bearing Cover	4	720	2880	0.068	98.333	C

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128	Cortis Filter Stand Height & Setting	1	2,800.00	2800	0.066	98.399	C
129	40 / 45 Block	409	6.5	2658.5	0.063	98.462	C
130	SIZE :- 1.125" (Antico)	5	525	2625	0.062	98.524	C
131	NACHI 6205.ZZ	26	100	2600	0.062	98.586	C
132	1/4 - 1.5" Inch Bolt	500	5	2500	0.059	98.645	C
133	Mechanical Seal	1	2,500.00	2500	0.059	98.705	C
134	S.S 316 Bolt 3/8*1"	200	12.47	2494	0.059	98.764	C
135	Plastic Box	120	20.2	2424	0.057	98.821	C
136	FLV - CHR - 1095	1	2,330.52	2330.52	0.055	98.876	C
137	80 F Fan 19 Bore	75	28.8	2160	0.051	98.927	C
138	Paid Big	327	6.5	2125.5	0.050	98.978	C
139	80 Std (268/28) Om	46	46	2116	0.050	99.028	C
140	1.000 CERAMIC SLEEVE 24.96*15*110	4	500	2000	0.047	99.075	C
141	1 1/4 T TYPE CERAMIC 63.5x33x50.8 x27	2	1,000.00	2000	0.047	99.123	C

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142	1 1/8 ANTICO T TYPE CERAMIC 59*30.50*46 *27	4	475	1900	0.045	99.168	C
143	1/4 - 1.1/4 Bolt	500	3.65	1825	0.043	99.211	C
144	Size;- 45.3*22.10*1 2.25 mm	4	450	1800	0.043	99.254	C
145	90 F 24 Vergin	50	34.4	1720	0.041	99.294	C
146	Oil Seal 17*30*7	100	17	1700	0.040	99.335	C
147	PVC Sticker	1,206.00	1.4	1688.4	0.040	99.375	C
148	3/8 Washer	2,000.00	0.84	1680	0.040	99.415	C
149	1.000,T TYPE CERAMIC 53*26.5*42.5 *18	4	400	1600	0.038	99.452	C
150	P P Back Plate for Alfa - 100 CT	2	790.5	1581	0.037	99.490	C
151	Filter Motor Changed Magnetic	1	1,500.00	1500	0.036	99.525	C
152	SKF 6207 ZZ	4	360	1440	0.034	99.560	C
153	Fan 15 Bore	50	26.6	1330	0.032	99.591	C
154	90L XXL (430/32) Om	2	650	1300	0.031	99.622	C
155	Brown Tape	36	35	1260	0.030	99.652	C

156	Cello Tape	36	35	1260	0.030	99.682	C
157	Strech Film Roll	5	250	1250	0.030	99.711	C
158	5/16 Washer	2,000.00	0.6	1200	0.028	99.740	C
159	HSS Tap Set - IT - 3/8" Bsw	1	800	800	0.019	99.759	C
160	M.S.Machine Screw	2,000.00	0.38	760	0.018	99.777	C
161	Feminal Box in High Quality	40	18.8	752	0.018	99.794	C
162	SKF 6206 ZZ	2	370	740	0.018	99.812	C
163	EN - 8 Bare Shaft	1	685	685	0.016	99.828	C
164	3/8 - SQ	3,000.00	0.21	630	0.015	99.843	C
165	SKF 6308.ZZ	1	630	630	0.015	99.858	C
166	1/4 Washer	1,500.00	0.42	630	0.015	99.873	C
167	12" Cloth Filter	24	25	600	0.014	99.887	C
168	12" Kapda	22	25	550	0.013	99.900	C
169	N.F. O,Ring - 14 x 3.5	103	5	515	0.012	99.912	C
170	6 MM SQ	5,000.00	0.1	500	0.012	99.924	C
171	Bearing No. 5205	1	500	500	0.012	99.936	C
172	Shaft Milling	19	25	475	0.011	99.947	C

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173	5 MM - SQ	5,000.00	0.09	450	0.011	99.958	C
174	S.S 202	500	0.8	400	0.009	99.968	C
175	Filter Rubber Oring	2	200	400	0.009	99.977	C
176	Copier Paper	2	195	390	0.009	99.986	C
177	S.S 202	500	0.6	300	0.007	99.993	C
178	Tissu Napkins	10	28	280	0.007	100.000	C

❖ **HML Analysis**

For HML analysis, all the items whose unit price value is above INR 10,000 are categorized as "H" items, items whose unit price lies between INR 10,000 and INR 1000 are categorized as "M" items, and items whose unit price is below INR 1000 are categorized as "L" items in this calculation

SR NO.	ITEM NAME	UNIT PRICE	CRITERIA
1	Turbine Blower	32,000.00	H
2	12" Filter 26 Plate 2.0 Hp	13,000.00	H
3	C.I.Self Priming Pump	12,900.00	H
4	HINDUSTAN 3 HP FOOT CUM FLANGE	12,781.00	H
5	12" Filter 22 Plate 2.0 Hp	12,500.00	H
6	For Side Jigs	12,200.00	H
7	P.P Filter 12" Plate Without Pump	12,000.00	H
8	12" Filter 18 Plate 1.0 Hp	12,000.00	H
9	JPP 120-PP SEAL TYPE PUMP	11,500.00	H

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10	10" Filter 18 Pad 1.0 Hp	10,500.00	H
11	Blue Star Plat Form Scale 500kg	10,500.00	H
12	JPP 100-PP SEAL TYPE PUMP	10,000.00	H
13	Electric Motor	9,261.00	M
14	Pew 1hp 1ph Pump Smb10	8,303.57	M
15	Crompton 3PH Electric Motor	8,011.00	M
16	90 Frame S/L Body Base Hole Drill Jig	7,750.00	M
17	80 Frame Body Base Hole Drill Jig	6,400.00	M
18	71 Frame Body Base Hole Drill Jig	5,500.00	M
19	Magnet Pump MP 30 - PH	5,016.00	M
20	Two Bone Side	5,000.00	M
21	Spring Two Bone Side	5,000.00	M
22	Bearing Housing3	4,100.00	M
23	76 X 60 CL	3,250.00	M
24	Long Shaft	3,172.00	M
25	Cortis Filter Stand Height & Setting	2,800.00	M
26	Painting Jigs	2,500.00	M
27	Mechanical Seal	2,500.00	M

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28	Mixer Grinders	2,457.67	M
29	FLV - CHR - 1095	2,330.52	M
30	Filter Repair Handle Cat Ring Welding	2,200.00	M
31	CFT (Sample)	1,800.00	M
32	BACK PLATE	1,800.00	M
33	1 1/8 UT-TB FACE GFT ROTARY	1,800.00	M
34	Filter Motor Changed Magnetic	1,500.00	M
35	Wooden Box (Peti)	1,236.00	M
36	1 1/4 T TYPE CERAMIC 63.5x33x50.8x27	1,000.00	M
37	SS 316 Cup Small	864.5	L
38	SS 316 Cup Big	812	L
39	HSS Tap Set - IT - 3/8" Bsw	800	L
40	SS 316 Cup Medium	799.67	L
41	SS 316 Cup 123	798.5	L
42	P P Back Plate for Alfa - 100 CT	790.5	L
43	1.000 UT-TB FACE GFT ROTARY	750	L
44	CI Bearing Cover	720	L
45	EN - 8 Bare Shaft	685	L

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46	90L XXL (430/32) Om	650	L
47	SKF 6308.ZZ	630	L
48	Trex 1000ml Vaccum Bottle	561	L
49	SIZE : 1.250" (Antico)	550	L
50	SIZE :- 1.125" (Antico)	525	L
51	1.000 CERAMIC SLEEVE 24.96*15*110	500	L
52	Bearing No. 5205	500	L
53	1 1/8 ANTICO T TYPE CERAMIC 59*30.50*46*27	475	L
54	Kulhad Glass	464.3	L
55	Size;-45.3*22.10*12.25 mm	450	L
56	Sr Ubha Dabba 19	437.5	L
57	90S Spl (290/32) Om	407	L
58	1.000,T TYPE CERAMIC 53*26.5*42.5*18	400	L
59	SKF 6206 ZZ	370	L
60	SKF 6207 ZZ	360	L
61	C.I Casting	342.78	L
62	SIZE :- 1.375" (Antico)	341.67	L
63	90s Std (288/32) Om	334	L

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64	80 Std (266/28) Om	334	L
65	90s Std (287/32)	334	L
66	Key & Nuts	310	L
67	PP ROD	301.67	L
68	80 Std (264/28)Om	295.33	L
69	AP DECO 101 GLOSSY BLUES	285	L
70	80 Std (264/28)	283	L
71	71 Std (239/22)	268	L
72	90 Body Std	250	L
73	Strech Film Roll	250	L
74	Spring Holder Contak	230	L
75	SIZE : 1.250"	225	L
76	SIZE :- 140*51*23mm	225	L
77	Big Cantak	215	L
78	PTFE (DRG)	203.5	L
79	Size :-1.000"	200	L
80	HYLEM GLAND PLATE AS PER DRG	200	L
81	Filter Rubber Oring	200	L

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82	Copier Paper	195	L
83	126 X 63 X55 CL	165	L
84	126 X 63 X55 CL	165	L
85	140 X 76 X 90 CLS	165	L
86	126 x 77 x 75 CL	165	L
87	140 X 76 X 90 CLS	165	L
88	140 x 76 x 60 CL	165	L
89	SIZE :- 50.10 x 33 x 45 x 11.3 mm	160	L
90	PTFE Step Ring	147	L
91	SKF 6205.ZZ	132	L
92	SIZE :- 45.10*27*36*11.30mm	130	L
93	Patti with Wires	125	L
94	76 X 90 CL	125	L
95	76 X 60 CL	125	L
96	80 Body Std	112	L
97	71 Body Std	112	L
98	M.S.Bolt	110	L
99	Small Contak	110	L

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100	77 X 75 CL	110	L
101	90 C 175 mm	105.4	L
102	SIZE :- 38*26*31*11 mm	100	L
103	NACHI 6205.ZZ	100	L
104	Skf 6204.ZZ	94.5	L
105	Bellow 25 mm Dia Mg1 - NeopSpl	90	L
106	Casting Small	90	L
107	90 Flange	90	L
108	63 x 25 x 55 CL	83.12	L
109	S.S. Shafting	75	L
110	CFT (DRG)	75	L
111	63 X 55 CL	75	L
112	80.C 158 mm	74.42	L
113	Metal Covers(Couls)	70.5	L
114	71 Flange	68	L
115	71 Covers	66.6	L
116	PTFE RINGS	66	L
117	80 Cover	52	L

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118	80 E/S	52	L
119	80 Std (268/28) Om	46	L
120	Metal Couls.72*72	40.2	L
121	N.F. O,Ring - 195 x 3.5	40	L
122	Brown Tape	35	L
123	Cello Tape	35	L
124	90 F 24 Vergin	34.4	L
125	90 F 24 Vergin	32.2	L
126	Fan Vergin	31.23	L
127	80 F Fan 19 Bore	28.8	L
128	Oil Seal 25*40*7	28	L
129	Tissu Napkins	28	L
130	Fan 15 Bore	26.6	L
131	Shaft 102 mm	26	L
132	12" Cloth Filter	25	L
133	12" Kapda	25	L
134	Shaft Milling	25	L
135	Metal Feminal Block	24.4	L

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136	Plastic Box 85*85	23.3	L
137	3/8 - 4" Inch Bolt	21.36	L
138	Plastic Box	20.2	L
139	Oil Seal 20*35*7	19	L
140	Feminal Box in High Quality	18.8	L
141	S S 316	18.76	L
142	Oil Seal 17*30*7	17	L
143	3/8 - 2" Inch Bolt	15.6	L
144	N.F. O,Ring - 105 x 3.5	14.5	L
145	3/8 - 1" Inch Bolt	14.25	L
146	Vifon Cordon O, Ring - 47.65 x 3.5	13	L
147	Vifon Cordon O'ring 38 x 3.5	13	L
148	S.S 316 Bolt 3/8*1"	12.47	L
149	5/16 - 1" Inch Bolt	12.22	L
150	5/16 - 2.1/2 Bolt	12	L
151	5/16 - 3" Inch Bolt	11.4	L
152	S.S Grab Screw - 5/16- 1/2	11	L
153	5/16 - 2.1/2 Bolt	9.93	L

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154	S.S 304	7.19	L
155	40 / 45 Block	6.5	L
156	Paid Big	6.5	L
157	5/16 - 1.1/4 Bolt	6.32	L
158	1/4 - 2" Inch Bolt	6.05	L
159	S.S Grab Screw - 5/16- 1/2	5	L
160	1/4 - 1.5" Inch Bolt	5	L
161	N.F. O,Ring - 14 x 3.5	5	L
162	Socket Head Cap Screw	4	L
163	1/4 - 1.1/4 Bolt	3.65	L
164	Alu Anodized Label	3.5	L
165	Socket Head Cap Screw	3	L
166	5/16 - Nuts	2.02	L
167	Allen Cap 5x35mm	1.85	L
168	2.5-5 SQMM RING TYPE LUGS 3D - 1304	1.67	L
169	PVC Sticker	1.4	L
170	3/8 Washer	0.84	L
171	S.S 202	0.8	L

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172	5/16 Washer	0.6	L
173	S.S 202	0.6	L
174	1/4 Washer	0.42	L
175	M.S.Machine Screw	0.38	L
176	3/8 - SQ	0.21	L
177	6 MM SQ	0.1	L
178	5 MM - SQ	0.09	L

❖ **Safety Stock**

For obtaining the safety stock calculations we collected lead time (maximum to minimum) collected from the industry guide which varies between Ten to fifteen days. Demand is assumed to be constant and the desired cycle service level (CSL) is assumed to be 95%, hence the Z value is 1.645. After collecting all the required parameters were obtained the desired value of safety stock for each item using the formula mentioned in Research methodology.

SR NO.	**ITEM NAME**	**DEMAND/ year**	**sigma L**	**Z value**	**Safety Stock (Units)**
1	Long Shaft	198	0.0309	1.645	10
2	M.S.Bolt	4,060.00	0.0309	1.645	206
3	SS 316 Cup Small	175	0.0309	1.645	9
4	76 X 60 CL	45	0.0309	1.645	2
5	SS 316 Cup 123	150	0.0309	1.645	8
6	SS 316 Cup Big	145	0.0309	1.645	7
7	126 X 63 X55 CL	631.5	0.0309	1.645	32

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8	PTFE (DRG)	481	0.0309	1.645	24
9	SS 316 Cup Medium	120	0.0309	1.645	6
10	Size :-1.000"	475	0.0309	1.645	24
11	Trex 1000ml Vaccum Bottle	155	0.0309	1.645	8
12	80 Std (264/28)Om	230	0.0309	1.645	12
13	Skf 6204.ZZ	707	0.0309	1.645	36
14	Turbine Blower	2	0.0309	1.645	0
15	CFT (Sample)	35	0.0309	1.645	2
16	For Side Jigs	5	0.0309	1.645	0
17	Big Cantak	275	0.0309	1.645	14
18	S.S. Shafting	770	0.0309	1.645	39
19	SKF 6205.ZZ	409	0.0309	1.645	21
20	C.I Casting	152	0.0309	1.645	8
21	Two Bone Side	10	0.0309	1.645	1
22	SIZE : 1.250"	212	0.0309	1.645	11
23	Wooden Box (Peti)	35	0.0309	1.645	2
24	126 X 63 X55 CL	260.5	0.0309	1.645	13
25	SIZE :- 38*26*31*11 mm	400	0.0309	1.645	20

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26	Sr Ubha Dabba 19	91	0.0309	1.645	5
27	Patti with Wires	315	0.0309	1.645	16
28	HINDUSTAN 3 HP FOOT CUM FLANGE	3	0.0309	1.645	0
29	90s Std (288/32) Om	110	0.0309	1.645	6
30	Bellow 25 mm Dia Mg1 - NeopSpl	397	0.0309	1.645	20
31	140 X 76 X 90 CLS	207	0.0309	1.645	11
32	126 x 77 x 75 CL	201.4	0.0309	1.645	10
33	SIZE : 1.250" (Antico)	60	0.0309	1.645	3
34	PTFE Step Ring	204	0.0309	1.645	10
35	Metal Covers(Couls)	400	0.0309	1.645	20
36	Electric Motor	3	0.0309	1.645	0
37	140 X 76 X 90 CLS	165.6	0.0309	1.645	8
38	80 Std (264/28)	91	0.0309	1.645	5
39	Painting Jigs	10	0.0309	1.645	1
40	Spring Two Bone Side	5	0.0309	1.645	0
41	SIZE :- 50.10 x 33 x 45 x 11.3 mm	156	0.0309	1.645	8
42	P.P Filter 12" Plate Without Pump	2	0.0309	1.645	0
43	Small Contak	215	0.0309	1.645	11

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44	S.S Grab Screw - 5/16-1/2	4,600.00	0.0309	1.645	234
45	JPP 120-PP SEAL TYPE PUMP	2	0.0309	1.645	0
46	140 x 76 x 60 CL	138	0.0309	1.645	7
47	90 C 175 mm	190	0.0309	1.645	10
48	JPP 100-PP SEAL TYPE PUMP	2	0.0309	1.645	0
49	80 Std (266/28) Om	58	0.0309	1.645	3
50	5/16 - 1" Inch Bolt	1,500.00	0.0309	1.645	76
51	90s Std (287/32)	54	0.0309	1.645	3
52	80.C 158 mm	241	0.0309	1.645	12
53	90 Body Std	68	0.0309	1.645	3
54	Casting Small	185	0.0309	1.645	9
55	63 x 25 x 55 CL	200	0.0309	1.645	10
56	S.S Grab Screw - 5/16-1/2	1,500.00	0.0309	1.645	76
57	Crompton 3PH Electric Motor	2	0.0309	1.645	0
58	Metal Feminal Block	626	0.0309	1.645	32
59	S.S 304	2,075.00	0.0309	1.645	105
60	5/16 - 2.1/2 Bolt	1,500.00	0.0309	1.645	76
61	PP ROD	49	0.0309	1.645	2

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62	AP DECO 101 GLOSSY BLUES	48	0.0309	1.645	2
63	SIZE :- 45.10*27*36*11.30mm	100	0.0309	1.645	5
64	12" Filter 26 Plate 2.0 Hp	1	0.0309	1.645	0
65	C.I.Self Priming Pump	1	0.0309	1.645	0
66	12" Filter 22 Plate 2.0 Hp	1	0.0309	1.645	0
67	5/16 - 2.1/2 Bolt	1,000.00	0.0309	1.645	51
68	12" Filter 18 Plate 1.0 Hp	1	0.0309	1.645	0
69	5/16 - 3" Inch Bolt	1,000.00	0.0309	1.645	51
70	3/8 - 4" Inch Bolt	500	0.0309	1.645	25
71	10" Filter 18 Pad 1.0 Hp	1	0.0309	1.645	0
72	Blue Star Plat Form Scale 500kg	1	0.0309	1.645	0
73	Magnet Pump MP 30 - PH	2	0.0309	1.645	0
74	HYLEM GLAND PLATE AS PER DRG	50	0.0309	1.645	3
75	Mixer Grinders	4	0.0309	1.645	0
76	Fan Vergin	275	0.0309	1.645	14
77	71 Std (239/22)	31	0.0309	1.645	2
78	Pew 1hp 1ph Pump Smb10	1	0.0309	1.645	0
79	Bearing Housing3	2	0.0309	1.645	0

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80	SIZE :- 140*51*23mm	35	0.0309	1.645	2
81	90 Frame S/L Body Base Hole Drill Jig	1	0.0309	1.645	0
82	80 Body Std	66	0.0309	1.645	3
83	Vifon Cordon O, Ring - 47.65 x 3.5	560	0.0309	1.645	28
84	Oil Seal 20*35*7	382	0.0309	1.645	19
85	3/8 - 1" Inch Bolt	500	0.0309	1.645	25
86	Kulhad Glass	15	0.0309	1.645	1
87	80 Cover	126	0.0309	1.645	6
88	80 Frame Body Base Hole Drill Jig	1	0.0309	1.645	0
89	5/16 - 1.1/4 Bolt	1,000.00	0.0309	1.645	51
90	N.F. O,Ring - 195 x 3.5	143	0.0309	1.645	7
91	Allen Cap 5x35mm	3,000.00	0.0309	1.645	152
92	71 Frame Body Base Hole Drill Jig	1	0.0309	1.645	0
93	Key & Nuts	17	0.0309	1.645	1
94	CFT (DRG)	70	0.0309	1.645	4
95	71 Body Std	46	0.0309	1.645	2
96	3/8 - 2" Inch Bolt	300	0.0309	1.645	15
97	Filter Repair Handle Cat Ring Welding	2	0.0309	1.645	0

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98	90 F 24 Vergin	136	0.0309	1.645	7
99	Oil Seal 25*40*7	150	0.0309	1.645	8
100	77 X 75 CL	38	0.0309	1.645	2
101	Vifon Cordon O'ring 38 x 3.5	315	0.0309	1.645	16
102	90S Spl (290/32) Om	10	0.0309	1.645	1
103	5/16 - Nuts	2,000.00	0.0309	1.645	102
104	Alu Anodized Label	1,152.00	0.0309	1.645	59
105	Socket Head Cap Screw	1,000.00	0.0309	1.645	51
106	Plastic Box 85*85	170	0.0309	1.645	9
107	Shaft 102 mm	149	0.0309	1.645	8
108	S S 316	200	0.0309	1.645	10
109	63 X 55 CL	50	0.0309	1.645	3
110	BACK PLATE	2	0.0309	1.645	0
111	1 1/8 UT-TB FACE GFT ROTARY	2	0.0309	1.645	0
112	80 E/S	66	0.0309	1.645	3
113	SIZE :- 1.375" (Antico)	10	0.0309	1.645	1
114	2.5-5 SQMM RING TYPE LUGS 3D - 1304	2,000.00	0.0309	1.645	102
115	71 Covers	50	0.0309	1.645	3

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116	Metal Couls.72*72	80	0.0309	1.645	4
117	76 X 90 CL	25	0.0309	1.645	1
118	76 X 60 CL	25	0.0309	1.645	1
119	PTFE RINGS	47	0.0309	1.645	2
120	71 Flange	45	0.0309	1.645	2
121	N.F. O,Ring - 105 x 3.5	210	0.0309	1.645	11
122	1/4 - 2" Inch Bolt	500	0.0309	1.645	25
123	1.000 UT-TB FACE GFT ROTARY	4	0.0309	1.645	0
124	Socket Head Cap Screw	1,000.00	0.0309	1.645	51
125	Spring Holder Contak	13	0.0309	1.645	1
126	90 Flange	32	0.0309	1.645	2
127	CI Bearing Cover	4	0.0309	1.645	0
128	Cortis Filter Stand Height & Setting	1	0.0309	1.645	0
129	40 / 45 Block	409	0.0309	1.645	21
130	SIZE :- 1.125" (Antico)	5	0.0309	1.645	0
131	NACHI 6205.ZZ	26	0.0309	1.645	1
132	1/4 - 1.5" Inch Bolt	500	0.0309	1.645	25
133	Mechanical Seal	1	0.0309	1.645	0

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134	S.S 316 Bolt 3/8*1"	200	0.0309	1.645	10
135	Plastic Box	120	0.0309	1.645	6
136	FLV - CHR - 1095	1	0.0309	1.645	0
137	80 F Fan 19 Bore	75	0.0309	1.645	4
138	Paid Big	327	0.0309	1.645	17
139	80 Std (268/28) Om	46	0.0309	1.645	2
140	1.000 CERAMIC SLEEVE 24.96*15*110	4	0.0309	1.645	0
141	1 1/4 T TYPE CERAMIC 63.5x33x50.8x27	2	0.0309	1.645	0
142	1 1/8 ANTICO T TYPE CERAMIC 59*30.50*46*27	4	0.0309	1.645	0
143	1/4 - 1.1/4 Bolt	500	0.0309	1.645	25
144	Size;-45.3*22.10*12.25 mm	4	0.0309	1.645	0
145	90 F 24 Vergin	50	0.0309	1.645	3
146	Oil Seal 17*30*7	100	0.0309	1.645	5
147	PVC Sticker	1,206.00	0.0309	1.645	61
148	3/8 Washer	2,000.00	0.0309	1.645	102
149	1.000,T TYPE CERAMIC 53*26.5*42.5*18	4	0.0309	1.645	0
150	P P Back Plate for Alfa - 100 CT	2	0.0309	1.645	0

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151	Filter Motor Changed Magnetic	1	0.0309	1.645	0
152	SKF 6207 ZZ	4	0.0309	1.645	0
153	Fan 15 Bore	50	0.0309	1.645	3
154	90L XXL (430/32) Om	2	0.0309	1.645	0
155	Brown Tape	36	0.0309	1.645	2
156	Cello Tape	36	0.0309	1.645	2
157	Strech Film Roll	5	0.0309	1.645	0
158	5/16 Washer	2,000.00	0.0309	1.645	102
159	HSS Tap Set - IT - 3/8" Bsw	1	0.0309	1.645	0
160	M.S.Machine Screw	2,000.00	0.0309	1.645	102
161	Feminal Box in High Quality	40	0.0309	1.645	2
162	SKF 6206 ZZ	2	0.0309	1.645	0
163	EN - 8 Bare Shaft	1	0.0309	1.645	0
164	3/8 - SQ	3,000.00	0.0309	1.645	152
165	SKF 6308.ZZ	1	0.0309	1.645	0
166	1/4 Washer	1,500.00	0.0309	1.645	76
167	12" Cloth Filter	24	0.0309	1.645	1
168	12" Kapda	22	0.0309	1.645	1

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169	N.F. O,Ring - 14 x 3.5	103	0.0309	1.645	5
170	6 MM SQ	5,000.00	0.0309	1.645	254
171	Bearing No. 5205	1	0.0309	1.645	0
172	Shaft Milling	19	0.0309	1.645	1
173	5 MM - SQ	5,000.00	0.0309	1.645	254
174	S.S 202	500	0.0309	1.645	25
175	Filter Rubber Oring	2	0.0309	1.645	0
176	Copier Paper	2	0.0309	1.645	0
177	S.S 202	500	0.0309	1.645	25
178	Tissu Napkins	10	0.0309	1.645	1

❖ **Economical Order Quantity (EOQ)**

Economical order quantity and optimum numbers of orders per year for each item have been obtained using the formulas mentioned Research methodology and all the corresponding calculations

SR. NO.	**ITEM NAME**	**DEMAND**	**frieght charges (ordering cost)**	**Holding cost**	**EOQ**	**No. of order per year**
1	Long Shaft	198	165.00	3.96	19	11
2	M.S.Bolt	4,060.00	1430.00	81.2	1326	3
3	SS 316 Cup Small	175	55.00	3.5	19	9
4	76 X 60 CL	45	275.00	0.9	11	4
5	SS 316 Cup 123	150	165.00	3	32	5

6	SS 316 Cup Big	145	198.00	2.9	34	4
7	126 X 63 X55 CL	631.5	682.00	12.63	295	2
8	PTFE (DRG)	481	605.00	9.62	218	2
9	SS 316 Cup Medium	120	605.00	2.4	55	2
10	Size :-1.000"	475	583.00	9.5	215	2
11	Trex 1000ml Vaccum Bottle	155	583.00	3.1	73	2
12	80 Std (264/28)Om	230	385.00	4.6	100	2
13	Skf 6204.ZZ	707	275.00	14.14	262	3
14	Turbine Blower	2	990.00	0.04	1	1
15	CFT (Sample)	35	550.00	0.7	19	2
16	For Side Jigs	5	572.00	0.1	3	2
17	Big Cantak	275	123.20	5.5	72	4
18	S.S. Shafting	770	123.20	15.4	205	4
19	SKF 6205.ZZ	409	121.00	8.18	112	4
20	C.I Casting	152	132.00	3.04	44	3
21	Two Bone Side	10	165.00	0.2	3	3
22	SIZE : 1.250"	212	96.80	4.24	55	4
23	Wooden Box (Peti)	35	97.90	0.7	10	4
24	126 X 63 X55 CL	260.5	97.90	5.21	72	4
25	SIZE :- 38*26*31*11 mm	400	97.90	8	114	4

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26	Sr Ubha Dabba 19	91	97.90	1.82	26	3
27	Patti with Wires	315	97.90	6.3	91	3
28	HINDUSTAN 3 HP FOOT CUM FLANGE	3	977.90	0.06	3	1
29	90s Std (288/32) Om	110	368.50	2.2	64	2
30	Bellow 25 mm Dia Mg1 - NeopSpl	397	368.50	7.94	233	2
31	140 X 76 X 90 CLS	207	368.50	4.14	124	2
32	126 x 77 x 75 CL	201.4	368.50	4.028	122	2
33	SIZE : 1.250" (Antico)	60	55.00	1.2	14	4
34	PTFE Step Ring	204	55.00	4.08	50	4
35	Metal Covers(Couls)	400	528.00	8	316	1
36	Electric Motor	3	1760.00	0.06	4	1
37	140 X 76 X 90 CLS	165.6	247.50	3.312	91	2
38	80 Std (264/28)	91	143.00	1.82	39	2
39	Painting Jigs	10	275.00	0.2	6	2
40	Spring Two Bone Side	5	473.00	0.1	4	1
41	SIZE :- 50.10 x 33 x 45 x 11.3 mm	156	286.00	3.12	96	2
42	P.P Filter 12" Plate Without Pump	2	2750.00	0.04	4	1
43	Small Contak	215	412.50	4.3	164	1

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44	S.S Grab Screw - 5/16-1/2	4,600.00	93.50	92	1693	3
45	JPP 120-PP SEAL TYPE PUMP	2	1650.00	0.04	3	1
46	140 x 76 x 60 CL	138	214.50	2.76	77	2
47	90 C 175 mm	190	214.50	3.8	114	2
48	JPP 100-PP SEAL TYPE PUMP	2	2200.00	0.04	4	1
49	80 Std (266/28) Om	58	33.00	1.16	14	4
50	5/16 - 1" Inch Bolt	1,500.00	462.00	30	1375	1
51	90s Std (287/32)	54	173.80	1.08	31	2
52	80.C 158 mm	241	173.80	4.82	137	2
53	90 Body Std	68	173.80	1.36	40	2
54	Casting Small	185	173.80	3.7	109	2
55	63 x 25 x 55 CL	200	429.00	4	185	1
56	S.S Grab Screw - 5/16-1/2	1,500.00	55.00	30	500	3
57	Crompton 3PH Electric Motor	2	275.00	0.04	2	1
58	Metal Feminal Block	626	242.00	12.52	455	1
59	S.S 304	2,075.00	36.30	41.5	591	4
60	5/16 - 2.1/2 Bolt	1,500.00	36.30	30	428	4
61	PP ROD	49	110.00	0.98	24	2

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62	AP DECO 101 GLOSSY BLUES	48	170.50	0.96	31	2
63	SIZE :- 45.10*27*36*11.30mm	100	190.30	2	70	1
64	12" Filter 26 Plate 2.0 Hp	1	3300.00	0.02	3	0.3
65	C.I.Self Priming Pump	1	3080.00	0.02	3	0.4
66	12" Filter 22 Plate 2.0 Hp	1	1705.00	0.02	2	0.5
67	5/16 - 2.1/2 Bolt	1,000.00	36.30	20	318	3
68	12" Filter 18 Plate 1.0 Hp	1	1617.00	0.02	2	0.5
69	5/16 - 3" Inch Bolt	1,000.00	36.30	20	326	3
70	3/8 - 4" Inch Bolt	500	36.30	10	168	3
71	10" Filter 18 Pad 1.0 Hp	1	1650.00	0.02	2	0.4
72	Blue Star Plat Form Scale 500kg	1	1650.00	0.02	2	0.4
73	Magnet Pump MP 30 - PH	2	715.00	0.04	3	1
74	HYLEM GLAND PLATE AS PER DRG	50	33.00	1	17	3
75	Mixer Grinders	4	198.00	0.08	3	1
76	Fan Vergin	275	5.50	5.5	40	7
77	71 Std (239/22)	31	27.50	0.62	10	3
78	Pew 1hp 1ph Pump Smb10	1	1474.00	0.02	2	0.4
79	Bearing Housing3	2	247.50	0.04	2	1

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80	SIZE :- 140*51*23mm	35	27.50	0.7	12	3
81	90 Frame S/L Body Base Hole Drill Jig	1	165.00	0.02	1	1
82	80 Body Std	66	33.00	1.32	25	3
83	Vifon Cordon O, Ring - 47.65 x 3.5	560	2.48	11.2	60	9
84	Oil Seal 20*35*7	382	3.00	7.64	45	9
85	3/8 - 1" Inch Bolt	500	4.63	10	74	7
86	Kulhad Glass	15	66.00	0.3	8	2
87	80 Cover	126	16.50	2.52	37	3
88	80 Frame Body Base Hole Drill Jig	1	440.00	0.02	2	1
89	5/16 - 1.1/4 Bolt	1,000.00	4.62	20	156	6
90	N.F. O,Ring - 195 x 3.5	143	16.50	2.86	44	3
91	Allen Cap 5x35mm	3,000.00	385.00	60	4562	1
92	71 Frame Body Base Hole Drill Jig	1	880.00	0.02	2	0.4
93	Key & Nuts	17	93.50	0.34	13	1
94	CFT (DRG)	70	93.50	1.4	54	1
95	71 Body Std	46	93.50	0.92	36	1
96	3/8 - 2" Inch Bolt	300	412.50	6	514	1
97	Filter Repair Handle Cat Ring Welding	2	396.00	0.04	3	1

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98	90 F 24 Vergin	136	187.00	2.72	162	1
99	Oil Seal 25*40*7	150	49.50	3	94	2
100	77 X 75 CL	38	49.50	0.76	24	2
101	Vifon Cordon O'ring 38 x 3.5	315	49.50	6.3	200	2
102	90S Spl (290/32) Om	10	49.50	0.2	6	2
103	5/16 - Nuts	2,000.00	49.50	40	1278	2
104	Alu Anodized Label	1,152.00	49.50	23.04	737	2
105	Socket Head Cap Screw	1,000.00	97.90	20	903	1
106	Plastic Box 85*85	170	56.10	3.4	117	1
107	Shaft 102 mm	149	84.70	2.98	127	1
108	S S 316	200	81.40	4	170	1
109	63 X 55 CL	50	84.70	1	43	1
110	BACK PLATE	2	198.00	0.04	3	1
111	1 1/8 UT-TB FACE GFT ROTARY	2	192.50	0.04	3	1
112	80 E/S	66	17.05	1.32	27	2
113	SIZE :- 1.375" (Antico)	10	60.50	0.2	8	1
114	2.5-5 SQMM RING TYPE LUGS 3D - 1304	2,000.00	95.96	40	1957	1
115	71 Covers	50	88.00	1	47	1
116	Metal Couls.72*72	80	88.00	1.6	76	1

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117	76 X 90 CL	25	126.50	0.5	29	1
118	76 X 60 CL	25	126.50	0.5	29	1
119	PTFE RINGS	47	126.50	0.94	55	1
120	71 Flange	45	126.50	0.9	53	1
121	N.F. O,Ring - 105 x 3.5	210	126.50	4.2	247	1
122	1/4 - 2" Inch Bolt	500	36.30	10	316	2
123	1.000 UT-TB FACE GFT ROTARY	4	36.30	0.08	3	2
124	Socket Head Cap Screw	1,000.00	36.30	20	635	2
125	Spring Holder Contak	13	36.30	0.26	8	2
126	90 Flange	32	185.90	0.64	47	1
127	CI Bearing Cover	4	185.90	0.08	6	1
128	Cortis Filter Stand Height & Setting	1	185.90	0.02	1	1
129	40 / 45 Block	409	121.28	8.18	504	1
130	SIZE :- 1.125" (Antico)	5	36.30	0.1	3	1
131	NACHI 6205.ZZ	26	132.00	0.52	34	1
132	1/4 - 1.5" Inch Bolt	500	38.50	10	358	1
133	Mechanical Seal	1	176.00	0.02	2	1
134	S.S 316 Bolt 3/8*1"	200	88.72	4	218	1
135	Plastic Box	120	149.12	2.4	172	1

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136	FLV - CHR - 1095	1	165.00	0.02	2	1
137	80 F Fan 19 Bore	75	126.50	1.5	105	1
138	Paid Big	327	121.00	6.54	450	1
139	80 Std (268/28) Om	46	88.00	0.92	54	1
140	1.000 CERAMIC SLEEVE 24.96*15*110	4	94.60	0.08	5	1
141	1 1/4 T TYPE CERAMIC 63.5x33x50.8x27	2	110.55	0.04	3	1
142	1 1/8 ANTICO T TYPE CERAMIC 59*30.50*46*27	4	88.00	0.08	5	1
143	1/4 - 1.1/4 Bolt	500	123.20	10	750	1
144	Size;- 45.3*22.10*12.25 mm	4	88.00	0.08	5	1
145	90 F 24 Vergin	50	88.00	1	65	1
146	Oil Seal 17*30*7	100	88.00	2	131	1
147	PVC Sticker	1,206.00	88.00	24.12	1590	1
148	3/8 Washer	2,000.00	242.00	40	4383	0.5
149	1.000,T TYPE CERAMIC 53*26.5*42.5*18	4	242.00	0.08	9	0.4
150	P P Back Plate for Alfa - 100 CT	2	242.00	0.04	5	0.4
151	Filter Motor Changed Magnetic	1	242.00	0.02	2	0.4
152	SKF 6207 ZZ	4	121.00	0.08	7	1

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153	Fan 15 Bore	50	121.00	1	87	1
154	90L XXL (430/32) Om	2	121.00	0.04	4	1
155	Brown Tape	36	60.50	0.72	46	1
156	Cello Tape	36	60.50	0.72	46	1
157	Strech Film Roll	5	60.50	0.1	6	1
158	5/16 Washer	2,000.00	60.50	40	2593	1
159	HSS Tap Set - IT - 3/8" Bsw	1	71.50	0.02	2	1
160	M.S.Machine Screw	2,000.00	60.50	40	3258	1
161	Feminal Box in High Quality	40	35.20	0.8	50	1
162	SKF 6206 ZZ	2	38.50	0.04	3	1
163	EN - 8 Bare Shaft	1	30.80	0.02	1	1
164	3/8 - SQ	3,000.00	67.38	60	5664	1
165	SKF 6308.ZZ	1	33.00	0.02	1	1
166	1/4 Washer	1,500.00	39.16	30	2159	1
167	12" Cloth Filter	24	26.40	0.48	29	1
168	12" Kapda	22	22.00	0.44	25	1
169	N.F. O,Ring - 14 x 3.5	103	33.00	2.06	151	1
170	6 MM SQ	5,000.00	16.50	100	5244	1
171	Bearing No. 5205	1	37.68	0.02	2	1

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172	Shaft Milling	19	27.50	0.38	26	1
173	5 MM - SQ	5,000.00	27.50	100	7136	1
174	S.S 202	500	27.50	10	757	1
175	Filter Rubber Oring	2	27.50	0.04	3	1
176	Copier Paper	2	27.50	0.04	3	1
177	S.S 202	500	27.50	10	874	1
178	Tissu Napkins	10	27.50	0.2	18	1

❖ **Inventory Turnover Ratio**

For obtaining the inventory turnover ratio we collected the annual sales data and annual inventory converted into finished product and from this collected data, we can obtain inventory turnover ratio

Year	**Net Sales (Rs.)**	**Avg. Inventory (Rs.)**	**Ratio**
2021-2022	9600000	4220246.38	2.24:1

V. RESULTS

According to the **ABC analysis** categorization results, 'A' lasses account for 22.7% of all products and account for 80% of total value utilisation every year. 'B' classes are those that account for 15.81% of total items and 10%of total value utilisation every year. And 'C' classes are those that account for 61.49% of total items and 10% of total value utilisation every year. Because the present industry has not implemented any control over the three types of commodities, it demonstrates that there is no adequate inventory management in this small-scale company. This study determines the amount of control that should be applied on certain items. This analysis will provide a frame of reference for control over various items ranging from high cost to low cost. In other words, of an item's unit price is very little but if it is a most circulating items and its monthly/annual consumption value is maximum, then closer and careful control will be done and vice versa.

Cumulative % of Inventory items	Cumulative % of total cost	Class	Degree of Inventory Management
22.7	80	A	Best
15.81	90	B	Better
61.49	100	C	Good

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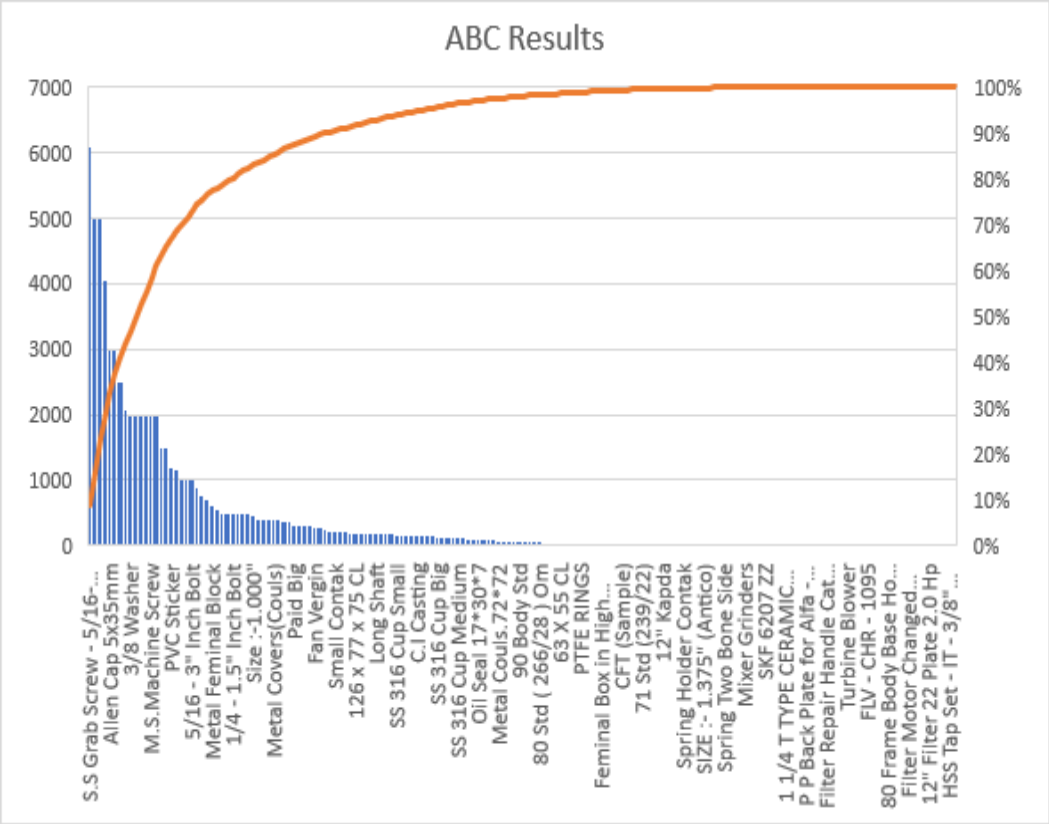

HML analysis categories were done to find out items according to their unit price to give relative importance. Table shows that out of 178 items 12 items were high priced items, 24 items were medium priced items and remaining 142 items were low priced items. HML analysis will help the manager to provide relative importance of items, decide the frequency of stock checking of items, exercise control on purchase and buying polices.

Category	No of items	% Of items
H	12	6%
M	24	13%
L	142	81%

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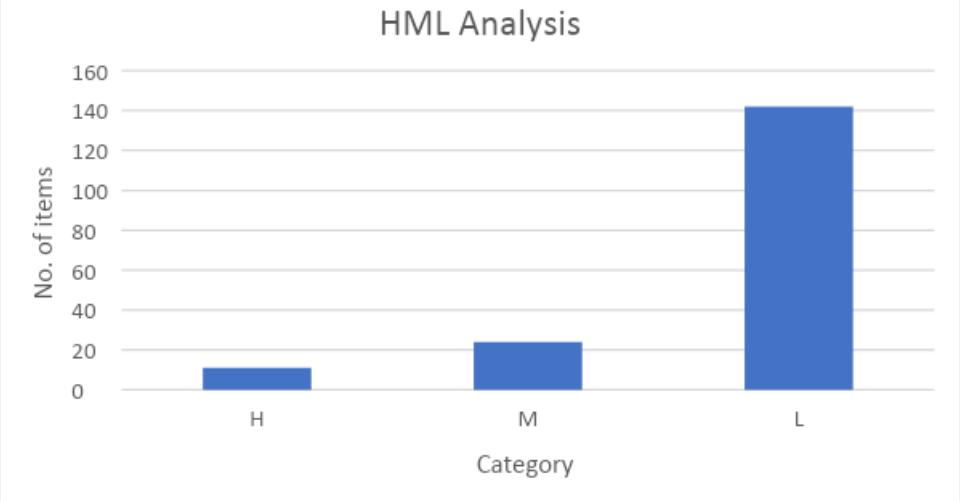
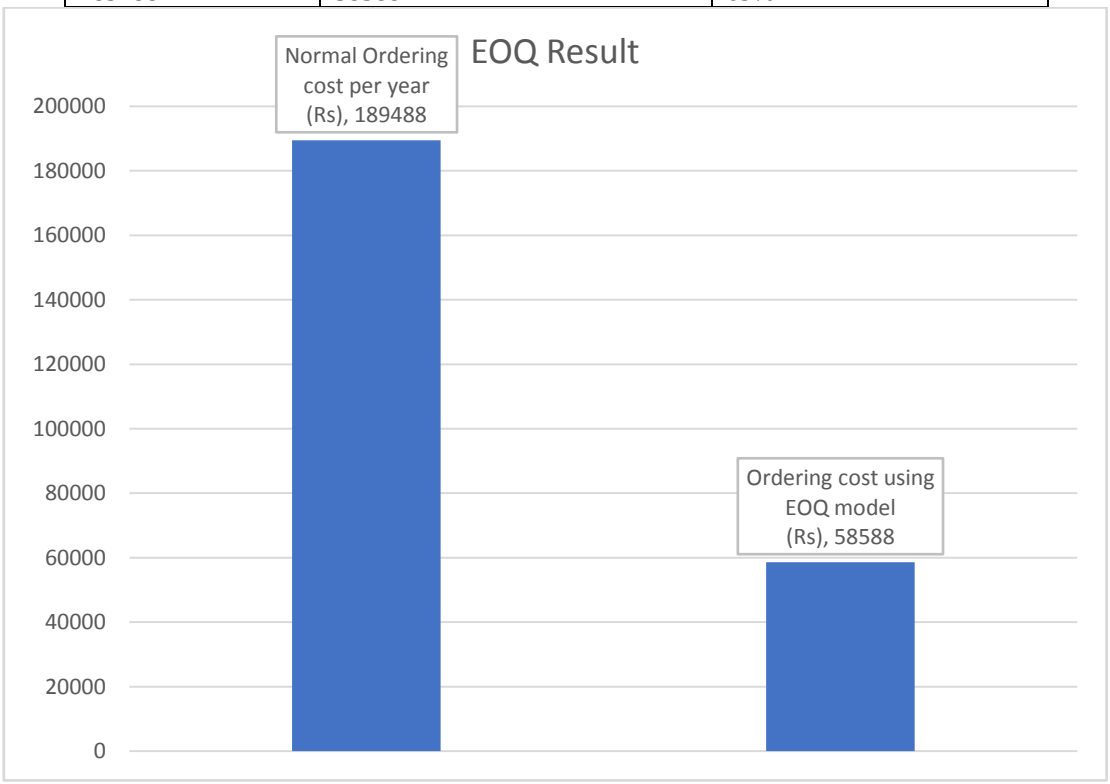


Apparently in industry no specific inventory method model is used, here raw materials are ordered through experience or when inventory is low in warehouse. By implying the **EOQ model**, we can help the industry reduce overstocking of inventory which will also help in reducing the ordering and holding cost of inventory items. So, we compared the total ordering cost for normal method (Existing method) or ordering inventory with Economical Order Quantity model's total ordering cost the following reduction in ordering cost by using EOQ model is highlighted below.

Normal Ordering cost per year (Rs)	Ordering cost using EOQ model (Rs)	% Reduction in ordering cost using EOQ
189488	58588	69%



Safety Stock analysis shows us the number of inventories for each item to be reserved in case of any variations in supply and demand. Safety stock acts as a buffer when inaccurate planning or miscommunication and mismanagement results in delay of product. You can handle an inaccurate forecast with your existing safety stock in place.

VI. CONCLUSION

In conclusion, the inventory system is a crucial area in material handling management. Scientific models are available to help choose the optimal inventory policy, and it is important to practice selective scientific inventory management to make it cost-effective. Long-term measures such as variety reduction and standardization, source development and optimization, and vendor rating, and lead-time reduction can also help reduce inventories. However, it is important to have realistic informational inputs like demand forecast, lead-time estimate, and cost estimates to effectively use inventory models.

The study found that in most cases, industries do not follow modern inventory management systems. The company studied in Goregaon, Maharashtra, orders raw materials based on experience or when inventory levels become low in the warehouse. They keep a two-month stock of raw materials and then place orders for the next lot, leading to overstocking or understocking problems. To minimize operational costs, the company needs a formalized inventory system. By conducting ABC and HML analyses, items can be categorized and given different levels of control. Calculating safety stock levels can also help maintain a safe inventory level based on demand. By using the Economic Order Quantity (EOQ) model judiciously, with management judgment, holding and ordering costs can be reduced. The industry's inventory turnover ratio, which highlights the ratio of net sales and average inventory, is also an essential factor to consider.

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