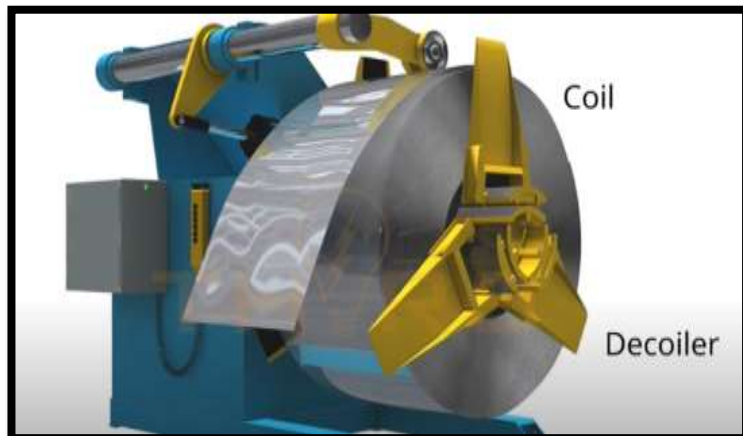
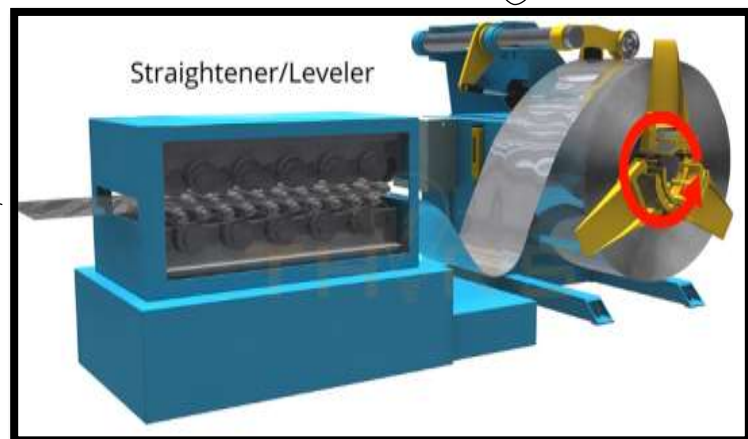


MOTOR STAMPING ANALYSIS

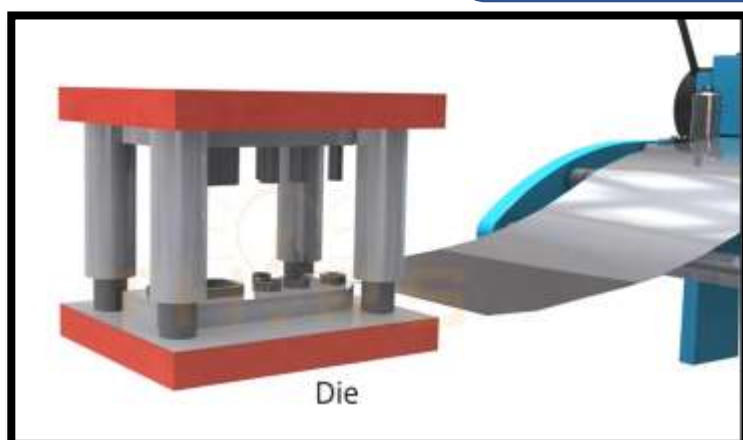
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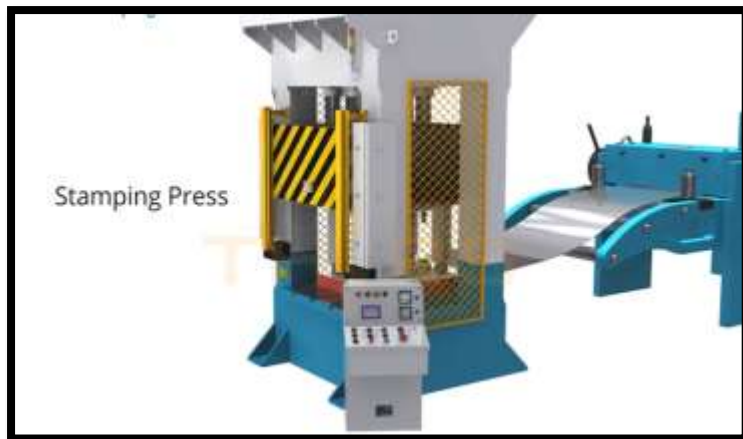
The process of motor stamping begins when a coil is loaded on a decoiler



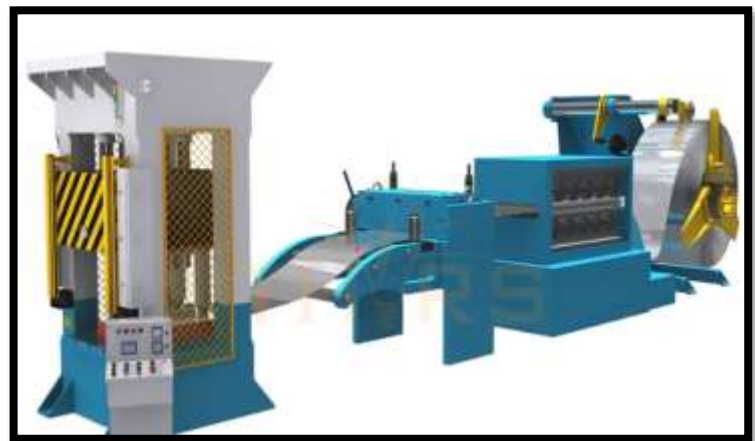
The coil rotates to unwind the material strip into the straightener. The straightener flattens the material prior to it entering the feeder.



The feeder advances the strip up material into the die. A die is a one of kind tool. The die is designed and constructed for one specific part.



The die is contained in a stamping press where the sheet is transformed into required shapes.



This process occurs in a continuous cycle and is called as stamping process.

Information inferred from
https://www.youtube.com/watch?v=ZJVf_locJao&ab_channel=THORSeLearningSolution

As a result, metal stamping is an innovative process used to create motor laminations for a diverse array of applications.

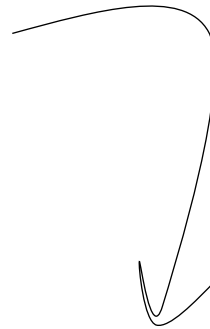
Motor stampings offers clients a wide range of customization capabilities, as the dies and materials used for this process can be designed to customer specifications.

Once the die is finalized by the client, motor stamping process proceeds.

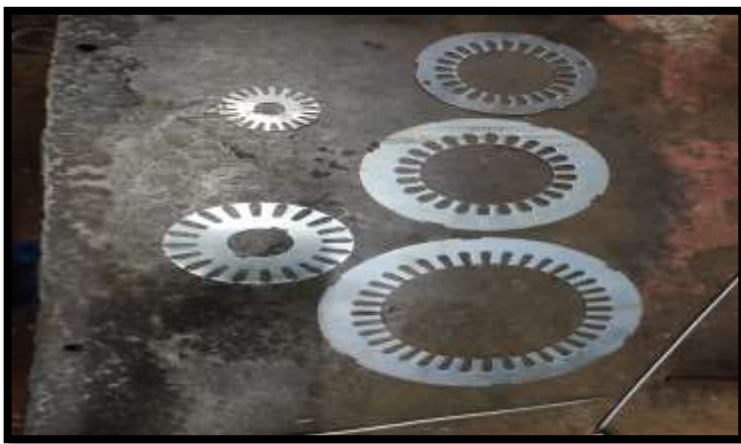
The die punches down the metal sheets into rings. These rings are basically the products shapes which are stacked on one another to produce the final product.



One of the many dies used by the company.



The metal sheet cut into different sizes by the die.





The final product.

The company's production in the month of October, November and December 2021 consisted of around nineteen thousand kgs corresponding to around 8 lakhs company's total profit. There are many other firms which also manufacture similar products. This brings

the market of motor stamping production under perfect competition.

The smallest size is 73 x 38mm (A) while the biggest size being 222 x 120mm (U). These products are sold in kgs. The selling price of all size products is same.

The company begins manufacturing the products once the client deal is confirmed. They produce fresh products every day. And deliver the orders within the ordered week.

For a 1kg order the company must manufacture approximately around 250 to 275 motor stampings for the smaller sizes which weighs around 3grams to 4grams each. Whereas, for the bigger sizes the company must manufacture approximately around 17 to 18 motor stampings which weighs around 55grams to 60grams each.

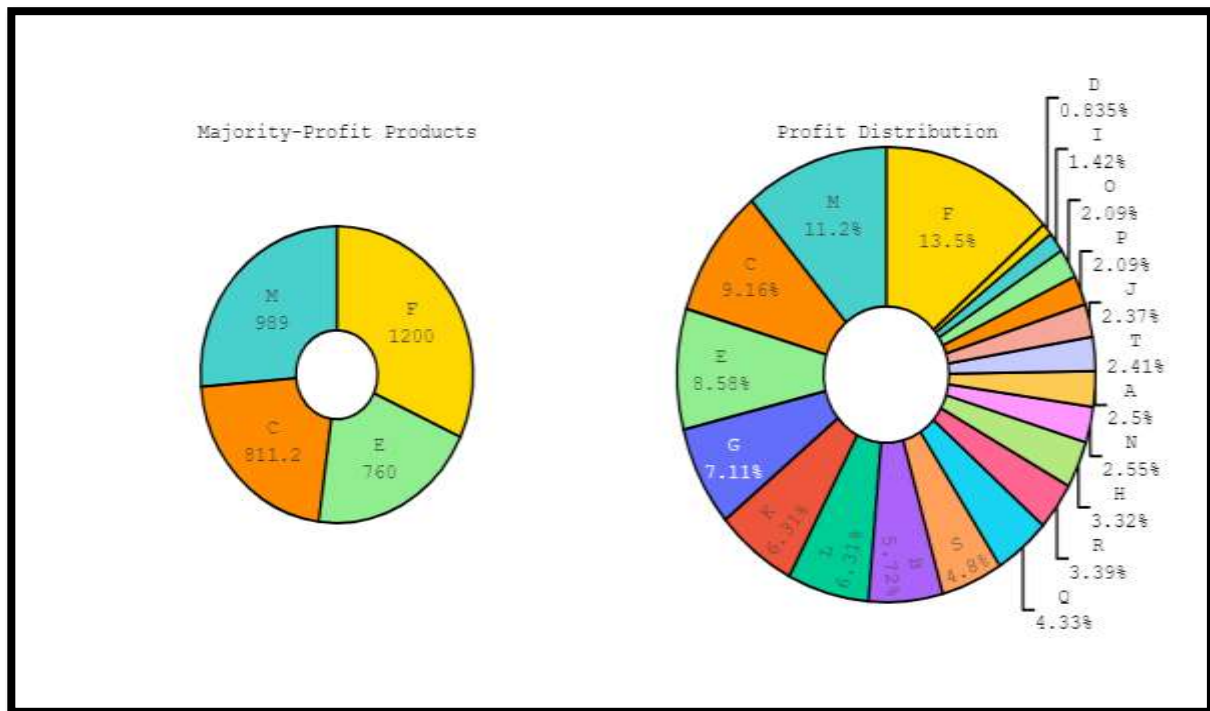
The insights of this business tell us that the major problem of the company lies in the small size motor stampings which are almost 30% of the company's total production. These small size products take more time to produce as there are a greater number of products to be produced per kg than the large size motor stampings.

The labors in the company are paid per day. Therefore, the more the time is consumed in making the products the more the production cost. Increase in production time caused by the small size products results in the increase of labor cost.

And, as mentioned earlier all the products are sold at same price. Therefore, the profits incurred by the large size product is more than that of the small size products. Causing the small size products to be least profit producing products.

The company is into this business for more than two decades. After conversing with the manager of the company on why to continue selling small size products if they are the least profit producing ones, he responded saying that, "we cannot be choosy about the products we want to produce and not produce. Here the competition is extremely high. Everyone wants to pull each other down by selling everything the clients demand for, and sometimes at a rate lower than the market rate. If we discontinue to produce small size products it may result in losing our clients to our competitors as the clients choose to order at a company where everything is available in one place."

Therefore, even if it means manufacturing products at minimum profit margin the company continues to do so to compete their competitors and not lose their clients.



The company produces around twenty-one products ranging from sizes 73 x 38mm which is the smallest size product and 222 x 120 mm which is the largest size.

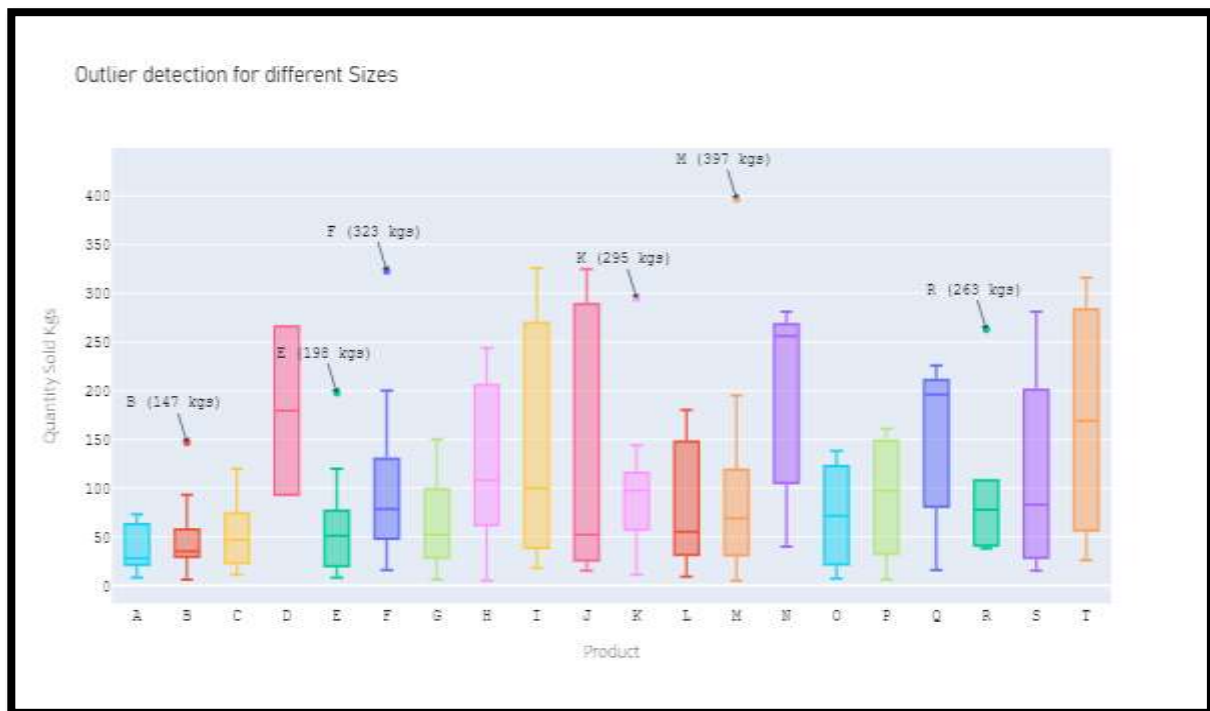
Products name Coded as:	Original Product names:
A	73 x 38 mm
B	87 x 48 mm
C	87 x 52 mm
D	V x 4 mm
E	105 x 58 mm
F	105 x 63 mm
G	126 x 72 mm
H	126 x 63 mm
I	126 x 80 mm
J	140 x 70 mm
K	140 x 76 mm
L	140 x 88 mm
M	155 x 100 mm
N	L x 56 mm
O	165 x 85 mm
P	165 x 104 mm
Q	180 x 95 mm
R	180 x 115 mm
S	210 x 135 mm
T	222 x 120 mm

These products are coded as A-U, A being the smallest size and U being the largest size as shown in the table for easy understanding while reading and for visualization.

The cumulative Profits incurred by the products in the month of October, November and December 2021 was seen the least for D which was around 0.835% of the total profits (around Rs 9000). The maximum profit producing product was F which was around 13.5% of the total profit.

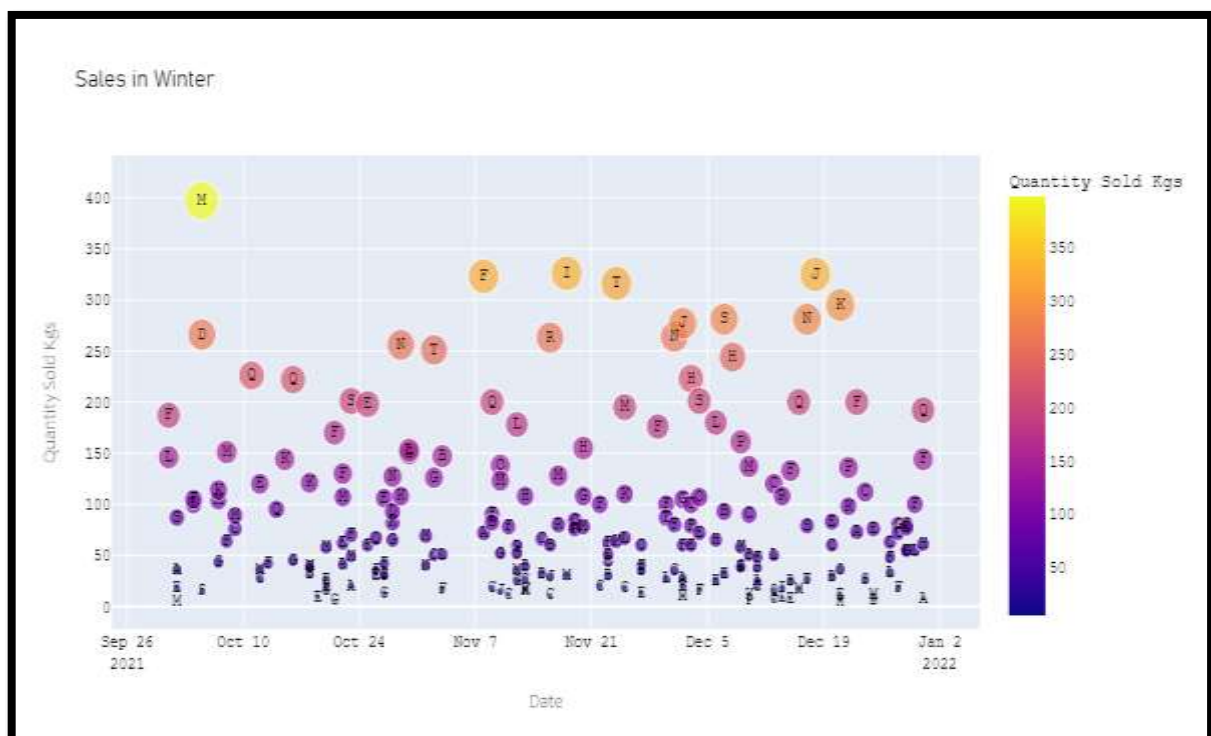
F product can be considered in the small size product group. The group which has less profit as compared to other products since it has high production cost. But even after it being from the group of low profit producing products, it has the highest profit in these three months, and that is because of the demand or the amount of quantity demanded was highest for F

by the clients. Therefore, more the sales of the product F result in more profit production by it. And hence the reason.



Outliers detected for the products B, E, F, K, M, R clearly tells that the demand for any specific product is not constant and can fluctuate according to season and client's need.

The highest quantity order was for product F and M in the consecutive last three months of 2021.



According to the data analysed for the quantities sold in the month of October, November, and December it can be incurred that as the months go by the quantity of the products demanded increase.

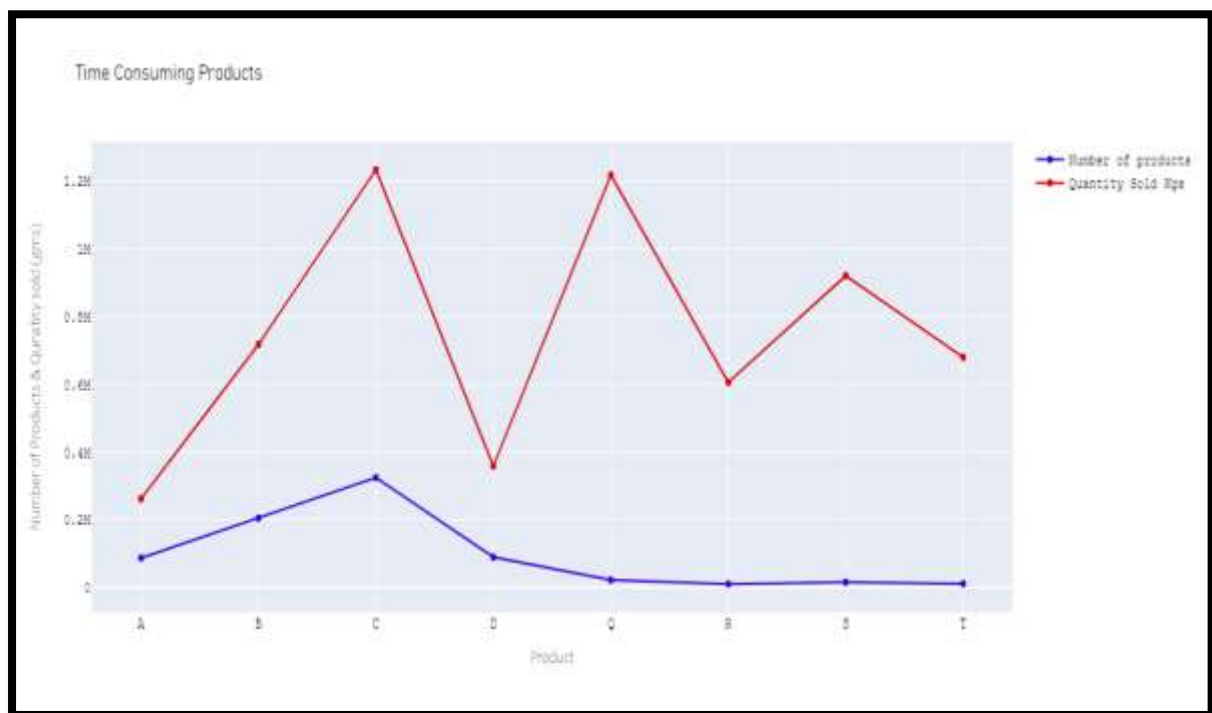
During the winter season many companies demand for motors. These motors after being bought from Metal Works is used in manufacturing of Fans, Air Conditioners, Blowers, Exhausts, Coolers.

All these products manufacturing process begins in winter. This gives the companies enough time to manufacture all these products till summers. During summers all these products are in immense demand to be bought by the customers. Therefore, the company begins the process in the season of winter and keeps it fresh and ready till summers.

As the summers season proceeds there's again huge demand for motors to be manufactured. During the summers the motors are used to begin the process of manufacturing of water pumps which are then widely demanded during the rainy season.

As a result, the companies begin ordering motors few months prior to the summer and rainy season.

Light Motor Works has majority of their quantity being demanded and sold in the season of Winters and Summers.



Another insight into the business which was analysed are the differences in profit and cost incurred by different products of the company.

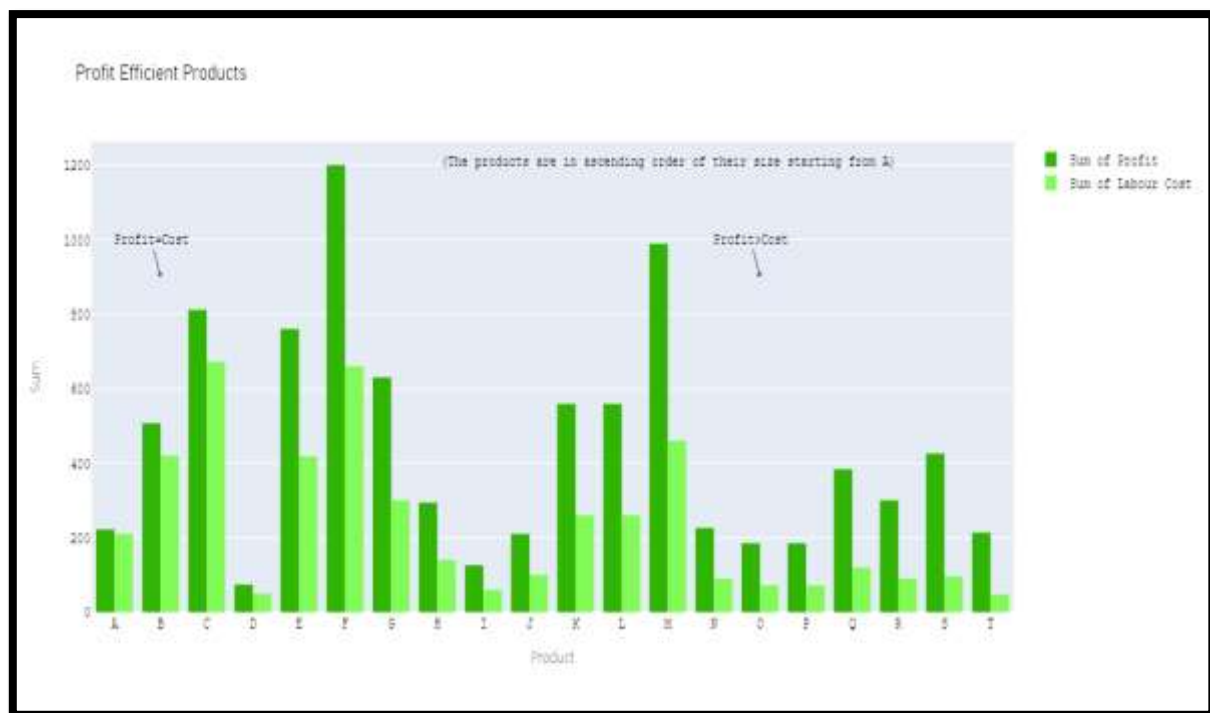
I made the analysis for the products A, B, C, D which fall in small size products group, and the products R, Q, S, T which fall in the large size products group.

Whenever an order is placed by a client it is always in the unit kilograms. For example, a client may order for 10 kilograms of size A and 10 kilograms of size R. Now, a size A weighs around 3gm. In order to produce size A which will be total of 1000 gm which is 1 kilogram the company has to manufacture at least 250 motor stampings of size A. Now, if the company has order of 10kg of size A it will add up to manufacturing 250 multiplied by 10 which will be 2500 products of size A to be manufactured.

Similarly, the job gets quicker, and easier when it comes to the larger size products. As mentioned above now if we consider a client's order of 10 kg of size R we can say that a size R weighs around 55gm. Therefore, to manufacture a 1 kg of product we will be needing around 17 motors to be produced. As, a result if we do the calculations for 10kgs of client's order by multiplying 10 with 17 its results in production of 170 motor stampings of size R.

This example shows us an exponential decrease in the number of products produced for different small and large size.

In the graph above there is an evident decrease in the number of products manufactured as the size of the product starts increasing. Therefore, it is very clear that there's an inverse relationship between the number of products to be manufactured and the size of the product.



The discussion of inverse relationship between the size of the product and the number of products to be manufactured does not end there. This inverse relationship furthermore also has affected the cost of production for the company.

The company majorly uses labour work along with machines to manufacture the products. There's absence of any automatic motor stamping manufacturing machine in the company. Machines are used to punch down the metal shapes of desired shape from the metal sheets. The operation of this task requires a labourer.

The stacking of these shapes on one another to generate a final product requires another labourer. Basically, the business of the company is labour oriented and dependent.

Therefore, more the products to be manufactured for an ordered size more is the labour work which corresponds to increase in the production cost of the product.

In the graph above the it is very evident that the company continues to manufacture and sell small size products even with a less profit margin as compared to the large size products.

Another reason why the company has continued to manufacture the small size products is due to its demand in the market. The owner of the company in his statement said that “we are small scale motor stamping manufacturing company. The clients who approach us are also from a similar background like ours. The client companies can be from a fan manufacturing background, Pump manufacturing background etc. Manufacturing of these products requires small size motors only. As a result, even with low profit margin we must give the market what it demands.”

The solution for this problem would be to minimize the labour cost. The labour cost can be minimized by substituting the labourers with an automatic metal stamping machine.

Basically, as mentioned above the conventional method for object stamping is manual, it is very time consuming and in non-automatic form. Continuous stamping or printing results in hand fatigue requires lots of efforts and affects the accuracy to result



So, the manual method must be replaced by PLC Automation. Automatic stamping of object has received significant attention because automatic stamping is reliable and reproducible. This not only reduce manual effort but also gives more time for marketing also prevent danger which might occur when human being works in hazardous environment. Automation greatly improves the profit and productivity; it is very scalable.

Now, for Light Metal Works, if they decide to invest in Automatic stamping machines it gets a little trickier to accept the investment. Because the company then will have to make investment in buying around 20 machines for the company's 20 different product sizes.

Each machine will only stamp one specific size. The smallest size machine costs around 15 Lakhs. Larger the product size huger will be the machine and more will be its price. Not only that, but also the electricity cost increases with the machine size. The manager also informed that they order metal sheets pieces instead of an entire metal sheet coil.

When asked the reason the manager responded by saying that "metal sheets are affordable and does the job. The coil on the other hand is expensive. The coil is the optimal metal sheet which is made to be used in automatic machines unless like ours. The metal sheets from the coil used in the automatic machines punches down the shape only in places where it has been engineered to. There is an immense amount of wastage and scrap which are the borders of the sheet which is then produced. This wastage is manageable and can be minimized in the manual machines. The laborers can move the sheets from under the machines and punch it on the places where they want. This results in the entire sheet being punched into feasible sizes."

Even if the company buys the machines, it is a small-scale business and doesn't have sales as much as what the machines will produce in a single day.

The company manufactures products only after they receive orders from the clients. That is, they produce fresh products and deliver it as soon as possible. If the company starts manufacturing products with the help of machines, they will need to store the extra products in a store house with least moisture, as the metal starts rusting if not stored appropriately. The company again must then invest to get store rooms.

The labour cost with all these step ups decreases. The efficiency of the company to manufacture the products with minimum faults increase too. But, buying twenty machines is not the optimal approach for a small-scale business like Light Metal Works.

The optimal approach is to buy machines only for small size products, and using labour force for manufacturing large size products with the company's old manual motor stamping machines. This will both substitute the immense time consumed to manufacture small size products, also reducing labour cost, and improving the product quality and optimality.

The investment to buy size B and C automatic stamping machines can be made as they are the most small-size demanded product by the market.

Calculations for one Automatic Machine:

	Automatic Machine	Manual Machine
Investment to be made:	15 Lakhs	-
Electricity cost per day:	1500 Rs	300 Rs
Quantity of product manufactured per day:	900 kg	50 kg
Labour cost per kg:	0.67 Rs	12 Rs