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Reduction in Time Required for Cooking and Delivering of Pizzas in Well-Known Company using Method Study and Work Measurement

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***Abstract:** This paper is based on method study and work measurement carried out at well-known pizza producing and delivering company, referred as XYZ company. One of the branches of XYZ company was facing issue of late deliveries. Hence method study was carried out to find the bottle neck and improve productivity without hampering the safety of operators. Case study involves standard time calculations at different stages like pizza preparation and delivery. Based on actual measurements various amendments in the plant layout have been made to ensure ease of the operator and flexibility in the method so as to increase productivity. The fact that this branch is one of the densely crowded branches of the company, it was important to address the time management. Method study revealed many improvements for increasing productivity.*

I. INTRODUCTION

One of the most essential factors to study work measurement and method study is to establish specific time and way of doing a task or activity. Both method and time ensures the activity is done with maximum productivity of the operator and within specified time limit i.e. standard time. This helps in understanding the bottle neck of the operation. Standard time is widely used concept in plethora of services by various companies. Work measurement involves standard time calculation for doing the activity by considering rating of operation. Contingency and relaxation allowances are taken into consideration to consider fatigue and safety of the operators.

II. TECHNIQUES AND TERMINOLOGIES

1) *Time Study:* Time study is a structured process of directly observing and measuring human work using a timing device to establish the time required for completion of the work by a qualified worker when working at a defined level of performance.
2) *Work Measurement:* Work measurement can be defined as the implementation of a series of techniques which are designed to find out the work content, of a particular task or activity, by ascertaining the actual amount of time necessary for a qualified worker, to perform the task, at a predetermined performance level.
3) *Performance Rating:* Performance Rating involves a trained observer making an assessment of the worker's rate of working relative to the observer's concept of the rate corresponding to standard rating. This assessment is based on the factors involved in the work such as effort, dexterity, speed of movement, and consistency. The assessment is made on a rating scale, of which there are three or four in common usage. Thus on the 0-100 scale, the observer makes a judgement of the worker's rate of working as a percentage of the standard rate of working (100).
4) *Allowances:* Allowances in time study can be defined as the extra time figures which are to be added to the basic time of an operation to account for personnel desires, delays, fatigue of operators, any extraordinary situation and the policies of the firm or organization.

III. DIFFERENT STATIONS WITH THEIR FUNCTION ARE DESCRIBED BELOW

XYZ company has different stations like Make Line, Oven,Cut Table, Order Dispatch, and OrderMonitoring.To find out bottleneck in the processand assess worker performance, flow process chart and time study were carried out. This study revealed the areas of improvements and helped in increasing productivity.

1) *Order Monitoring:* All the online and offline orders are monitored at this station.
2) *Make Line:* Pizza base preparation, toppings, vegetables added to base.
3) *Oven:* Loading on oven
4) *Cut Table:* Unloading, cutting, extra toppings, boxing, packing.
5) *Order Dispatch:* Order rechecking, allocation,
6) *Delivery:* Order acceptance, order delivery.

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IV. MAN-POWER DISTRIBUTION AND PIZZAS PROCESSED AT EACH STATION

Data is collected for 120 minutes by observing each station during different time periods like peak time, fall time and mean numbers are mentioned below.

1) Make line:3 people
a) Supervisor
b) Operator 1
c) Operator 2
2) Cut Table: 2 people
a) Operator 1
b) Operator 2
3) Order monitored: 1 Person
4) Delivery: 8 to 10 people

V. OBSERVATIONS

A. Overall Time Study Pizza Preparation

Non-Peak day: Monday to Friday
Peak day : Saturday &Sunday
Phase 1: 11 am to 2pm
Phase 2 : 2 pm to 7 pm
Phase3: 7pm to 11 pm

Non Peak Days: Monday to Friday

	Station (MIN)							Total Time
Phase	Base Preparation	Adding toppings	Baking in oven	Cut-Table	Order monitoring	Dispatch	Home Delivery	(MIN)
Phase1	0.75	1.85	8.9	1	1.2	0.65	13.4	27.75
Phase2	0.6	1.7	8.9	0.6	1.2	0.6	13	26.6
Phase3	0.5	1.5	8.5	0.5	1	0.5	12.2	24.7

On Non-peak days, online and offline orders are less when compared to peak days. In phase 1 very less orders are processed due to less demand. In phase 2 considerable orders are served. In the evening, offline orders are high in demand. So management becomes very critical as far as customer satisfaction is considered.

Peak Day: Saturday and Sunday

	Station (MIN)							Total Time
Phase	Base Preparation	Adding toppings	Baking in oven	Cut-Table	Order monitoring	Dispatch	Home Delivery	(MIN)
Phase1	0.7	1.95	8.9	0.9	1.1	0.85	12.9	27.30
Phase2	0.55	1.8	8.9	0.5	1.15	0.45	12.8	26.15
Phase3	0.45	1.3	8.5	0.4	0.8	0.5	12.2	24.15

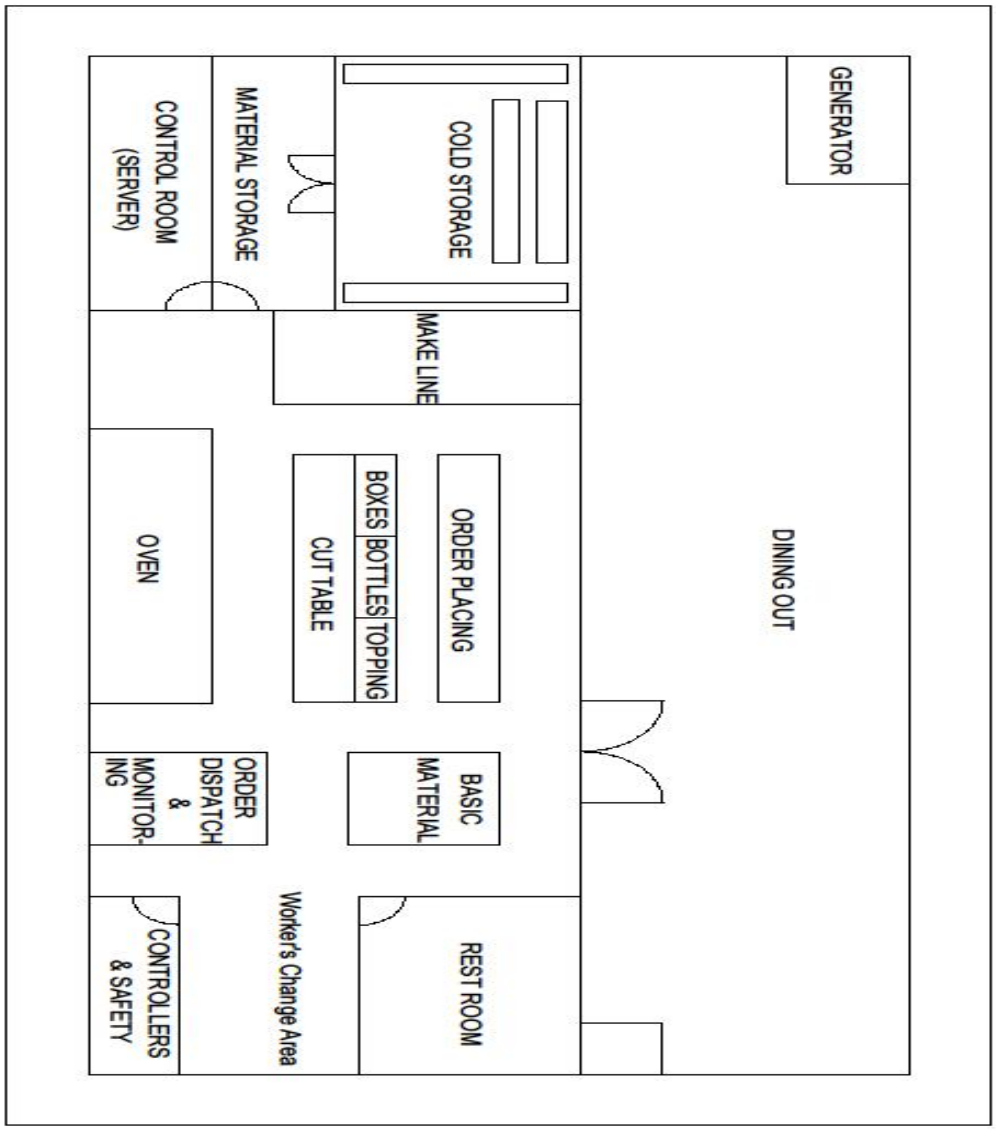
During peak days the number of orders hiked irrespective of the phase or time of the day. Delays in delivery occurred mostly during this period. Hence preparation and delivery time needed to be reduced to keep that delay in check.

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B. Detailed Time Study for Pizza Preparation

Sr.No.	Event/Station	Observed time	Performance Rating	Allowance	Standard Time
		(min)	%	(min)	(min)
1	Base preparation	0.5	120		0.6
	Adding toppings and vegetables	1.5	110	0.5	2.15
2	Baking in oven	8.5			8.5
3	Cut Table	0.5	110		0.55
4	Order monitoring	1	100	0.1	1.1
5	Dispatch	0.5	80	0.1	0.5
6	Delivery	12.2	90	0.2	11.18
				Total Standard Time	24.68

C. Old Plant Layout



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D. Operation Chart Of Pizza Making And Delivery Process

Sr.no.	Process	Symbol	Title
1	Pick the bunch of raw base from storage room		Transport
2	Prepare pizza base from raw base	O	operation
3	Add toppings and vegetables	O	Operation
4	Wait if pizzas are already loaded above limit	D	Delay
5	Load the pizza in the oven	O	Operation
6	Wait until is it baked	O	Operation
7	Take out the pizza from the oven	O	Operation
8	Put the pizza on cut table		Transport
9	Cut the pizza as per size	O	Operation
10	Check for the extra toppings	D	Delay
11	Take out toppings and bottles from shelf		Transport
12	Add extra toppings as per customer's requirements	O	Operation
13	Boxing of the pizza	O	Operation
14	Transport the boxes to monitoring section		Transport
15	Check for the other items of the order	D	Delay
16	Allocate the order and wait for the delivery person	D	Delay
17	Dispatch the order		Transport
18	Delivery of the order	O	Operation

As per operation chart, many unwanted movements occurred during pizza preparation and delivery process of one pizza. These non-value added movement should be eliminated by proper plant layout which will ensure no unwanted movements will occur. This will reduce the total time required to prepare and delivery one pizza.

VI. RECOMMENDATIONS

A. Keep frequently needed materials from cold storage room separately so that they can be easily accessible as shown in corrected power plant.(Material accessibility)

B. Dispatch table's orientation should be changed so that screen and table should be aligned to avoid unnecessary movement of worker. (Operator comfort)

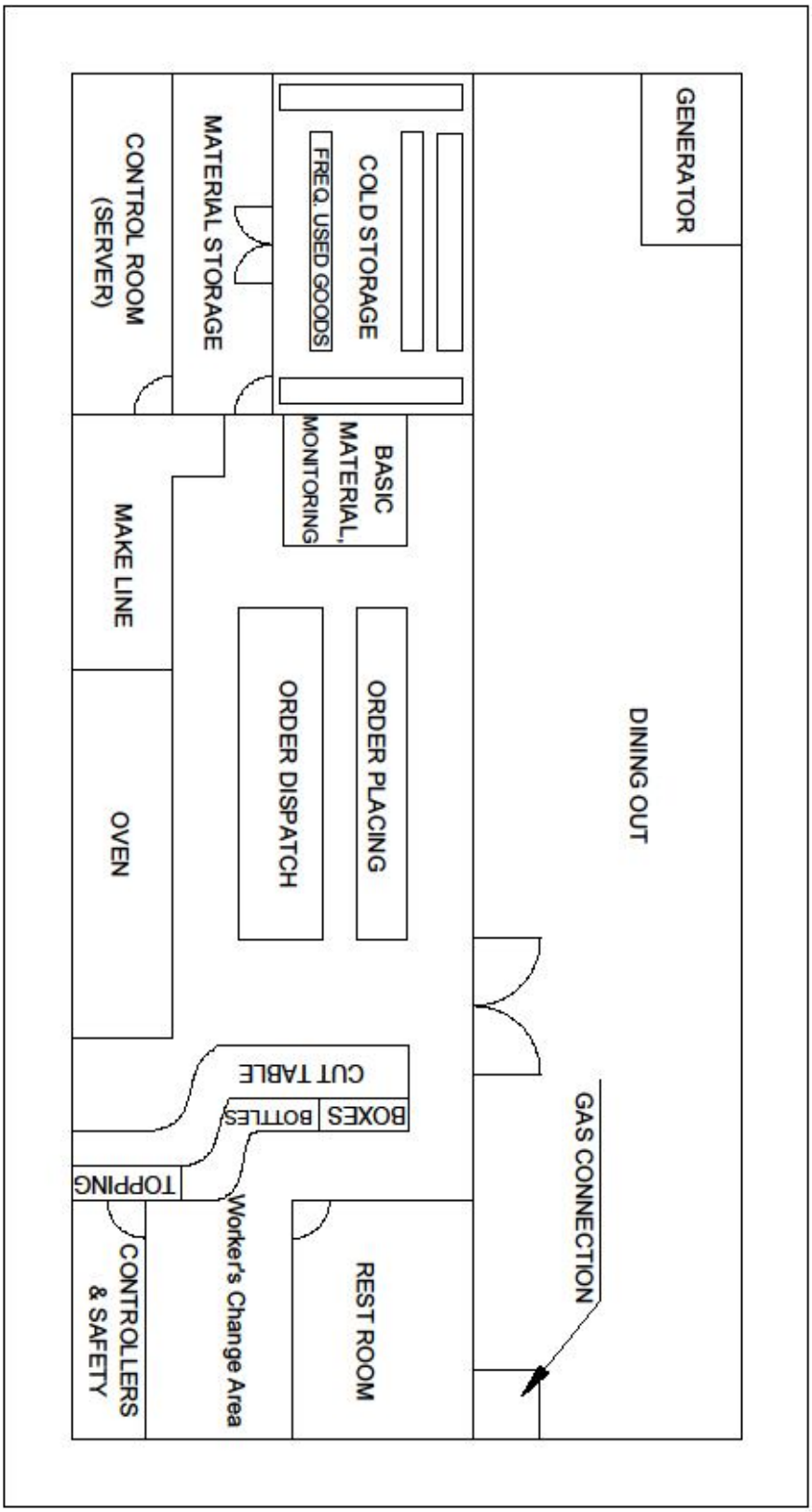
C. New plant layout can be designed for less material movement.

D. Extra time should be given for delivery to compensate for unnatural delays like traffic. This can be achieved by reducing overall operation time.

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VII. NEW PLANT LAYOUT



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A. Detailed Time Study for Pizza Preparation

Sr.No.	Event/Station	Recorded Time	Rating	Allowance	Standard Time
		(min)	%	(min)	(min)
1	Base preparation	0.3	120		0.36
	Adding toppings and vegetables	1	110	0.5	1.6
2	Baking in oven	8.5			8.5
3	Cut Table	0.5	110		0.55
4	Order monitoring	0.5	100	0.2	0.7
5	Dispatch	0.5	80	0.1	0.5
6	Delivery	12	90	0.2	11
				Total Standard Time	23.21

B. Overall Time Study for Pizza Preparation

Non-Peak day: Monday to friday

	Station (Min)							Total Time
Phase	Base Preparation	Adding toppings	Baking in oven	Cut-Table	Order monitoring	Dispatch	Delivery	
Phase1	0.6	1.65	8.9	0.6	0.7	0.55	13.2	26.2
Phase2	0.6	1.5	8.9	0.5	0.7	0.6	13	25.8
Phase3	0.5	1.4	8.5	0.4	0.7	0.5	12.2	24.2

Peak Day: Saturday and Sunday

	Station (Min)							Total Time
Phase	Base Preparation	Adding toppings	Baking in oven	Cut-Table	Order monitoring	Dispatch	Delivery	
Phase1	0.5	1.55	8.9	0.55	0.7	0.5	12.9	25.60
Phase2	0.55	1.4	8.9	0.4	0.65	0.5	12.8	25.20
Phase3	0.45	1.3	8.5	0.3	0.5	0.4	12.2	23.65

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C. Operation chart of pizza Making and Delivery Process

Sr.no.	Process	Symbol	Title
1	Pick the bunch of raw base from storage room	⇨	Transport
2	Prepare pizza base from raw base	O	operation
3	Add toppings and vegetables	O	Operation
4	Wait if pizzas are already loaded above limit	D	Delay
5	Load the pizza in the oven	O	Operation
6	Wait until is it baked	O	Operation
7	Take out the pizza from the oven	O	Operation
8	Cut the pizza as per size	O	Operation
9	Check for the extra toppings	D	Delay
10	Add extra toppings as per customer's requirements	O	Operation
11	Boxing of the pizza	O	Operation
12	Transport the boxes to monitoring section	⇨	Transport
13	Check for the other items of the order	D	Delay
14	Allocate the order and wait for the delivery person	D	Delay
15	Dispatch the order	⇨	Transport
16	Delivery of the order	O	Operation

VIII. RESULTS

A. After implementing various techniques of work measurement nearly 1.5 minutes of time have been saved.

B. Workers movement was significantly reduced which made material and other movement smooth and reduced operation time.

C. Plant layout was studied to unwanted movements and distance travelled. e.g. orientation of dispatch table to reduce neck movement of the operator. Since, operator of dispatch had to check for items and do the packing accordingly. Operator used to have 180 degree neck movement frequently. Because of new orientation, operator will have maximum 60 degrees of movement in either direction. Hence ease of operation was improved.

D. Delivery is made smooth by providing extra time for this critical operation. Company offers 30 minutes of time for delivery. By reducing overall time by 30 minutes, delivery person has more time for delivery. As late deliveries would cost the company, it is important to ensure timely delivery.

E. Plant layout design changes ensured minimum material and man movement while improving efficiency and productivity.

IX. FUTURE SCOPE

A. New technology is evolved in oven section. So company may opt to purchase new oven which takes less than 6 minutes to prepare pizza.

B. New software for delivering goods can be adopted. Delivery boy has to update his position 5 times per delivery results in wastage of lot of time. Hence auto updating or tracking can be done instead.

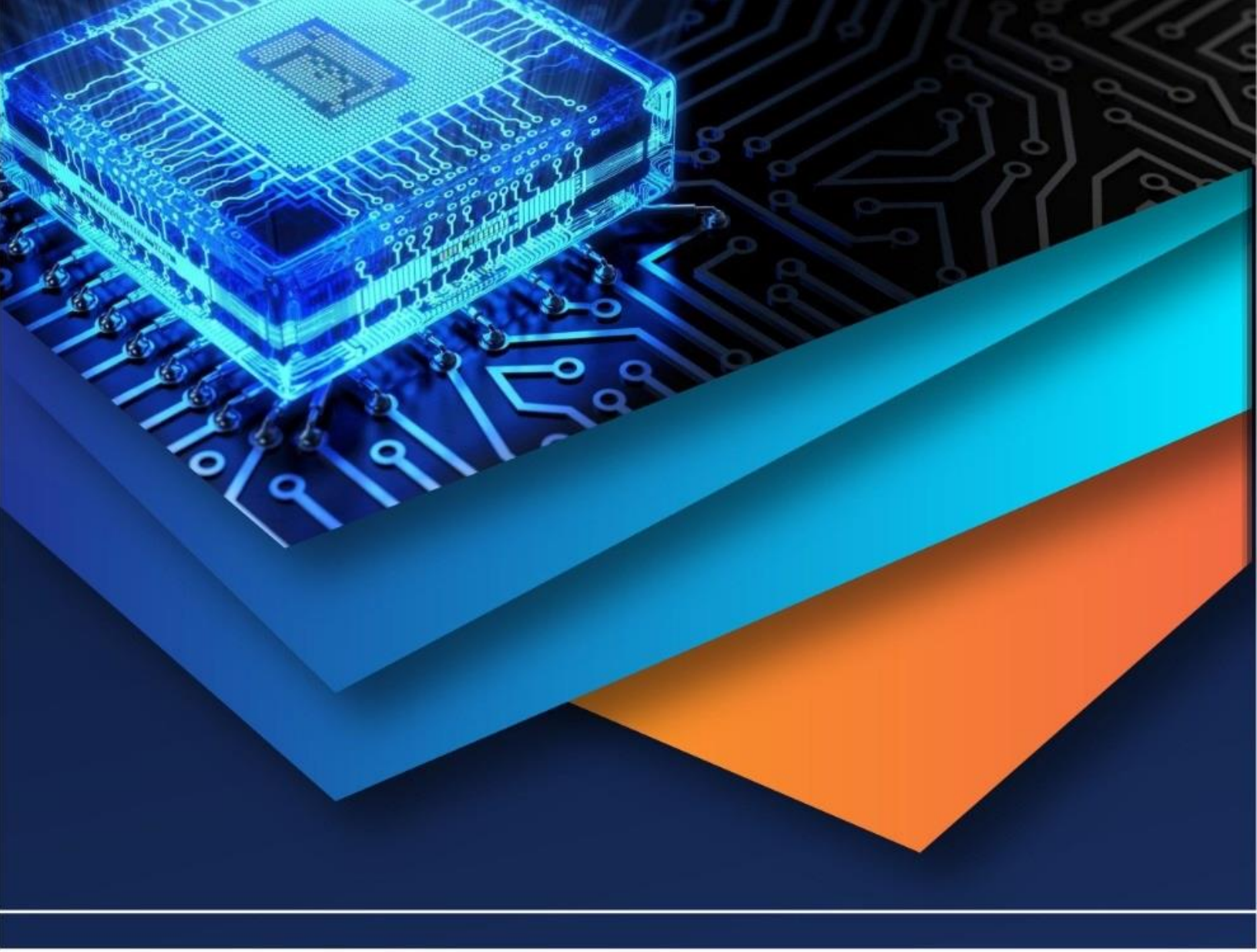
C. Better packaging techniques can be adopted to ensure proper conditioned, hot and sturdy packaging. Since many complaints are regarding damaged packaging.

D. Newly prepared make line table can be designed and manufactured according to items requirement. Some items are required in almost every type of pizza while some are rarely used. So make line table can have different shapes and sizes to keep variety of items properly.

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