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Study and Implementation of Material Handling System in Vikram Plasticizes Unit 2

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Abstract: ***The handling of material or equipment is the one of most essential aspect into manufacturing processes and industries. The most of plastic product manufacturing industries originate (produce) waste material from finish product and reprocess (reuse) that waste. The main objective of this research to provide the automatic material (waste) transferring system instead of manual transfer system. In Vikram Plastisizers there is tow blow molding machine M/c-1 & M/c-2 and 4 injection molding and to reprocess of waste they have one grinding machine that produce granules are used with raw material. The grinding machine is nearby to M/c-1 where waste is convey by the belt conveyor system and that is very easy to transfer waste material from M/c-1 to grinder. But in case of M/c-2 there is not any convenience for transferring waste to the grinder, for now this process (activity) of conveying waste is done by manual transferring to the grinder. This process will enhance all type of costs and manpower compare to the M/c-1. So in this research we are going to study and design for conveying waste from M/c-2 to the grinder. So will able to reduce all type costs, human effort, working condition as well as safety which is very essential.***

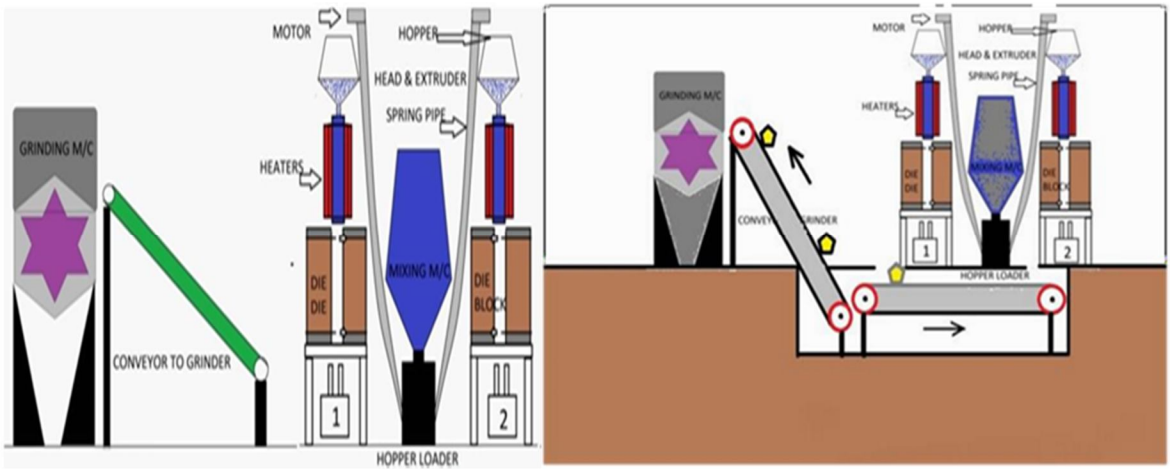
Keyword: Material Handling System, Vikram Plastisizer, Conveyor, Belt Conveyor System, Automation, Blow Molding & Grinding Machine, Waste Material

I. INTRODUCTION

The aim of the present research is to improve material handling in vikram plasticizers we want to transfer material with the help of conveyor. There is so many types of material transferring system in industries but we have to select most compatible and sustainable conveying system to implement in particular industry. We have no. option which can use in this case but there is important to consider all factors like Initial cost, manpower, safety, maintenance cost, compatibility and other parameters. Transport equipment are used to moving of material from one position to another. (e.g., between workplaces, between a loading dock and a storage area, etc.), the main subcategories of the different transport equipment mainly are conveyors, cranes, and industrial trucks. It also can be transported by manually using no equipment but it time consuming and lake of safety.

A. Introduction about Industry and Problems

The Vikram plasticizers has more than 10 years old. They manufacture drums from 5 Liters capacity to 235 Liters. Capacity with various openings like Narrow Mouth, Wide Mouth and Full Open Barrel. The Vikram plasticizers company is ISO 9001:2000 Certified. And company having UN certification for drums to transport dangerous goods. All our products confirm to ISI and UN standards and are approved by Indian Institute of Packaging. All the labs are certified with each and every consignment. All the employees are well qualified and experience.



B. Problem Summery

1) The study of industry indicate the some problems are facing related to the material transfer. As plastic manufacturing industry are required very high arrangement of conveyor systems which can reduce total time that required for transferring material from one place to another. As we know the company produces plastic containers at very large quantity without any compromise with quality.

2) There is mainly tow blow molding machine that produce continues production of drums more than 200 ltr.

3) Due to this process is done by blowing high pressure air hence it produce extra flash to block air at top and bottom side of die. The produce flash is nearly 2 kg from every drum that comes from the machine. As we aware that plastic can recycle or reuse after some process is done. This grinder hence waste is automatically transfer to the grinder.

4) But in case M/c: 2 there is not any kind of facility is available that waste can transfer to grinder automatically so they have only one option is to convey waste to the grinder manually storing into drum and then is transfer manually to the grinder. Due to this extra work they required 2 more labor as compare to M/c: 1 which can increase cost behind every drum.

5) So in this research we are going to design material transferring system for M/c: 2 to reduce that extra cost required for manual work, for now company has to spend 1200 Rs/day that mean annually Rs.432000 extra as compare to M/c: 1. So we can design conveying system that required one time investment and periodically maintenance that 100% less that extra cost.

II. METHODOLOGY

A. Going forward, a selection of best suitable type of conveyor system as per research and study we decided select belt conveyor system because the weight of material is to transfer is very less (2kg/min) hence this system is use for light weight material transfer so it is most suitable for this problem.

B. Then we use a CAD program (Autodesk Inventor Professional) is used to generate conceptual designs and technical drawing.

C. Design Considerations for belt conveyor system.

D. Calculations of all single parameters for every element which can use in system (Belt Dimension, Capacity, Speed, Roller Diameter, Belt Power, Pulley Diameter, Motor, Shaft Design and Control)

E. The principles, law and equations of machine design and mechanical element are used for prepare most suitable design for new conveyor system.

III. CONCEPTUAL DESIGN

A. Design Considerations

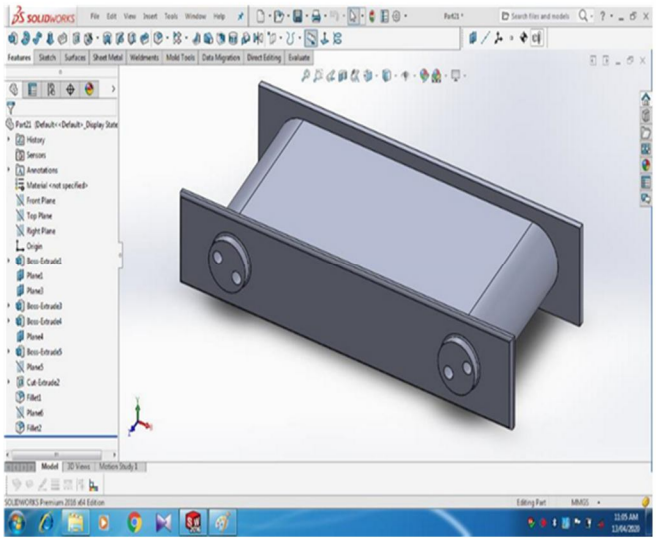
1) Designing the system for continuous flow of material (Idle time should be zero).

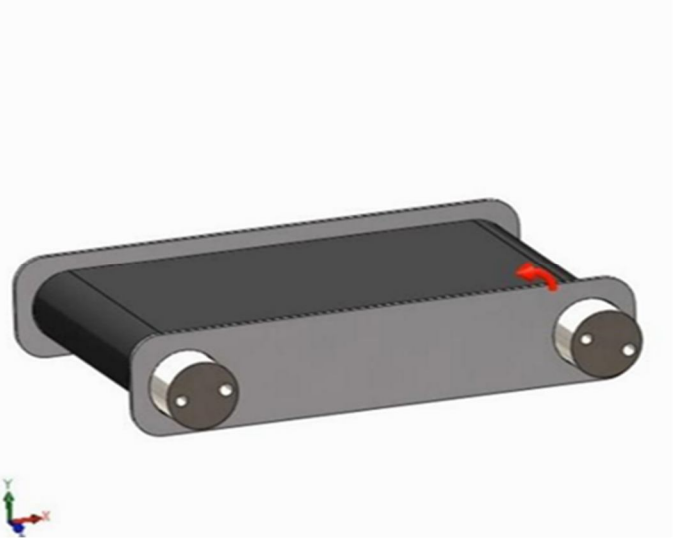
2) Going in for standard equipment with ensure low investment and flexibility.

3) Incorporating gravity flow in material flow system.

4) Assume suitable and required data for design the system.

5) Consideration of principles, law and equations of machine design and mechanical element are used for prepare most suitable design for new conveyor system.





B. Design Of Conveyor Belt

1) Selection of Material

Need – High elongation, mostly replaceable by polyester-nylon, Cheaper in rate, High impact resistant.
So, we can choose Nylon belt.

2) Capacity (C)

C = W^2 × M × 0.5 ÷ 1.085 × 60 , ton/hr.

Where, W = Width of belt

M = Material density

So, we have [P200 – 220 & PN 500/2]

So according to table of PN 500/2 = we have strength { 150 to 450 KN/m }

C = (800)^2 × 1.67 × 0.5 ÷ 1.085 × 60 C = 5.44 ton/hr.

Therefore :- Material density = 1.67 kg/m^3 ,

Velocity ray = 0.5 m/s

3) Effective Belt Tension (Te)

P = Te × V ÷ 33000 [Tmax = Te × V]

1× 33000 ÷ 0.5 = Te

Te = 66000 N

Te = 66 KN

3 Idler spacing = 8 × Te × Sag ÷ W × 9.81 × 10^3

where, Sag = Is 18 for weight of above 300 kg.

= 8 × 66000 × 18 ÷ 322 × 9.81 × 10^3 = 3 m

T2 = Te × K

where, T2 = Tension in slack side K = Drive factor

From standard data at μ = 0.30 of arc of contact is 180 the value of K is = 0.64

= T2 = Te × K

= 66000 × 0.64

= T2 = 4.224 KN

= T1 ÷ T2 = e^μθ [Take μ = 0.3 & θ = π = 180°]

= T1 ÷ 4.224 = e^0.3 × π

T1 = 4.24 × 2.566

T1 = 10.8812 KN

4) Diameter of shaft (d)

Ƭmax = Upto 300 KN / m

We consider 250 KN / m

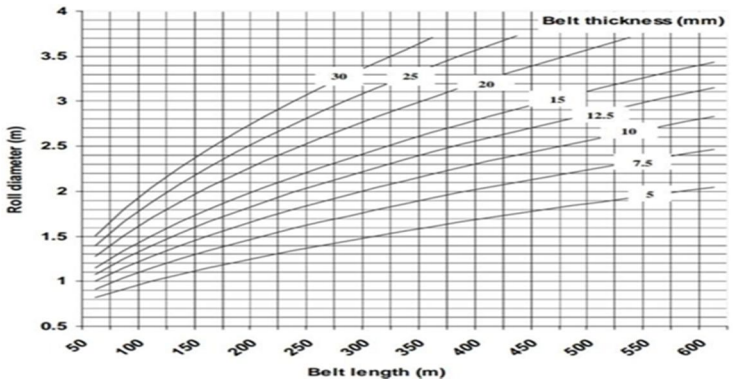
Ƭmax = 16 Te ÷ π × d^3 d^3 = 16 × 66000 × 10^3 ÷ π × 250

d^3 =1344540.95

d = 110 .37 mm. (Material use MS)

5) *Diameter of Roller (D):* From the standard table recommended minimum pulley diameter of PN 200 – 220 is 360 mm. Material used for manufacturing MS.

Figure Belt roll diameter



As per diameter of shaft we consider inner diameter of roller is 111 mm.
From the standard data table recommended mass and thickness requirement for loading is 5.1 kg/m^2.
Considering from standard data table Thickness of Nylon belt is 12mm – 16mm We take 15 mm thickness of belt.

6) *Mass of belt (M)*

$$M = (Q + C / 3.6 \times V) \times L$$

where, L= Length of center distance (As per requirement of company 30 × 30.25 = 907 mm) Q = Is mass of moving part kg/m by referring table of PN 500/2 at diameter of shaft 145.7 mm is value of Q is 33.

(By referring table of PN 500/2 at diameter of shaft = 145.74 mm)

$$M = (33 + 5 / 3.6 \times 0.5) \times 9.04$$

$$M = 322 \text{ kg}$$

M = Total mass of material load

$$L = 2 C + 1.57 (D + d)$$

$$L = 2 \times 9.04 + 1.57 (0.360 + 0.360)$$

$$L = 19 \text{ mm}$$

Roller width = 850 mm
(From standard table we conclude the belt width is 800 mm, so allowable clearance = 25 & 25 mm both side, so roller diameter is 850 mm).

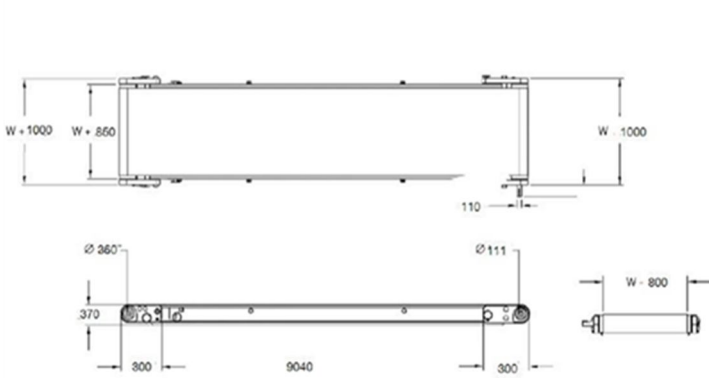
C. Design of Rolling Contact Bearing

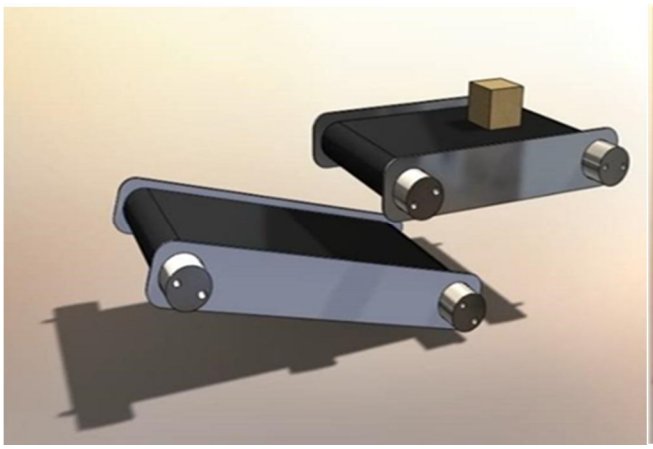
1) *Definition:* The bearing in which the contacting surface have rolling contact, are known as rolling contact bearing.
2) *Single – row Deep Groove ball Bearing:* This bearing take radial as well as thrust load. They have high radial load carrying capacity as well as moderate thrust load carrying capacity.
3) *Designation of Bearing:* 6 8 22 where, 6 = Deep groove ball bearing
   8 = Extra heavy series
   22 Bore (22 × 5) = 110mm (Outside diameter = 140mm)

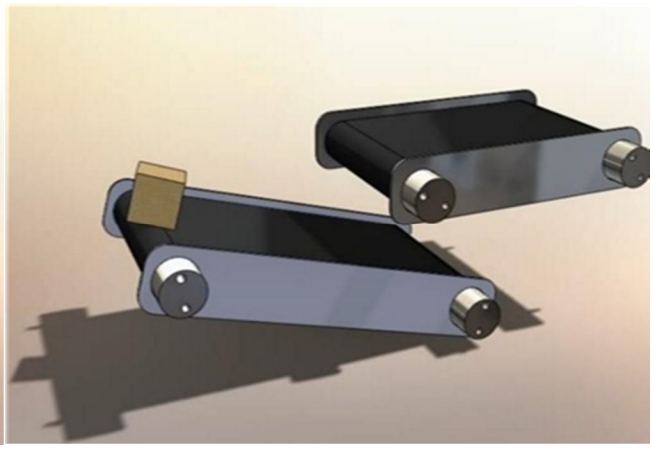
D. Motor Specification

AC motor is required for this system
KW: 075 %Eff: 76.0 Hz: 30 Duty: S1
HP: 1 IP: 55 V: 415 A: 19
Frame: 80
Input – Single Phase
Output speed – 3000 rpm
Shaft Diameter: 19
Shaft Length: 40

E. CAD Design & Model







F. Quotation of Elements

SR.	ITEMS	SPECIFICATION	UNIT PRICE	QUANTITY	AMOUNT
1.	ROLLERS	D 360 L 1200 MS	13700	2	27400
2.	SHAFT	d 150 l 1250 MS	10300	2	20600
3.	FRAME	9200 X 400 X 4	7000	1	7000
4.	NYLON BELT	1 meter square	700	24	16800
5.	BEARING	6822	3769	4	15076
6.	AC MOTOR	1 HP	4203	1	4203
7.	STARTER	20 – 30 A	1779	1	1779
8.	INSTALLATION EXPENSES	Manpower per day	1000	20	20000
				TOTAL AMOUNT	Rs. 112858

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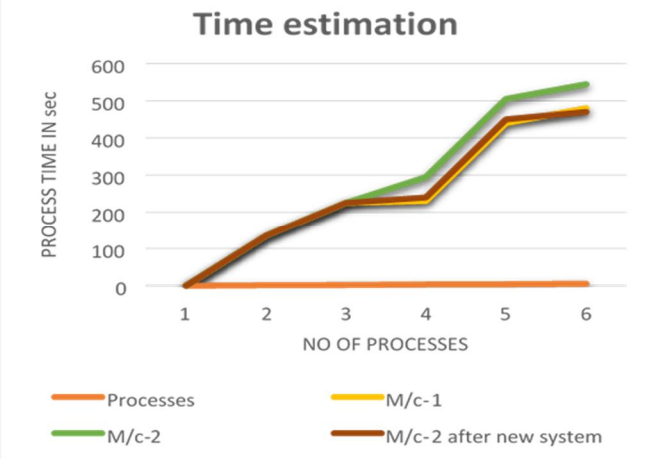
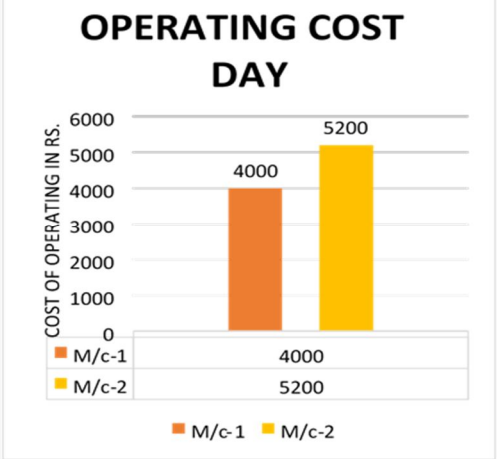
IV. CHARTS

A. Time Estimation Charts

4.1 Time estimation chart



4.2Cost estimation graph



RESULTS

Sr.	Processes	Machine 1	Machine 2	After M/c-2 Implementation
1	Product produce from the machine	135 sec	135 sec	**135 sec**
2	Remove unwanted material	90 sec	90 sec	**90 sec**
3	Collect flash into drum and transfer to grinder(Manually)	–	70 sec	–
4	Transfer flash directly with help of conveyor	5 sec	–	**15 sec**
5	Operation on post cooler	210 sec	210 sec	**210 sec**
6	Final finishing of product	40 sec	40 sec	**40 sec**
	Total time required for finish product	**480 sec/drum**	**545 sec/drum**	**490 sec/drum**

Time Estimation

No. of labors	M/c-1	M/c-2	After M/c-2 Implementation	Manpower wages per day
Machine operator	4	4	4	600 Rs/day
Worker	4	4	4	400 Rs/day
Helper (Flash handling)	–	4	-	300 Rs/day
Total manpower required per day	8	12	8	
Total manpower cost to run M/c	**4000 Rs/day**	**5200 Rs/day**	**4000 Rs/day**	Min.1300 Rs/day

Cost Estimation

B. Result In Time

M/c- 1= 200 * 480 sec
= 96000 sec required for producing 200 drums per day for M/c 1
M/c- 2= 200 * 545 sec
= 109000 sec required for producing 200 drums per day for M/c 2
Difference = 109000 – 96000
= 13000 sec/shift = 216 min/shift

• After implementation of new conveyor system

M/c-2= 200 * 490 sec
= 98000 sec required for producing 200 drums per day for M/c 2
Now Difference =98000 – 96000
=2000 sec/shift = 33 min/shift

The analyzing of difference before and after implementation of system we save 11000 sec/shift (183 min/shift) and that will improve production per shift compare to old system.

C. Result In Cost

1) Before Implementation

a) Total cost of manpower run

M/c = M/c1 + M/c2 = 4000 + 5200 = 9200 Rs/day

= 9200 * 365 = 3358000 Rs/annum

b) Total extra cost compere to

M/c2 - M/c = 5200 – 4000 = 1200 Rs/day

= 1200 * 30 = 36000 Rs/month

= 1200 * 365 = 438000 Rs/annum

2) After Implementation

a) The total cost for run m/c1 and m/c2 is become same due no extra manpower is required for flash handling to grinder.

b) Total cost of manpower run M/c = M/c1 + M/c2 = 4000 + 4000 = 8000 Rs/day

= 8000 * 365 = 2920000 Rs/annum

 After implementation of new belt conveyor system we company will save 438000 Rs/annum that required for flash handling to grinder which is not necessary.

V. CONCLUSION

After designing and implementing suitable new conveyor belt system for M/c2, the conveyor system required one time investment of Rs.112858 and company can reduce that unnecessary material handling cost of 438000 Rs/annum transfer flash to the grinder will be eliminated after implementing of new conveyor system. Before this conveyor system the and operation of material handling is done by manually which required extra manpower compere to m/c1 hence operating cost is increases at very high amount and another important point is regarding to safety which most essential aspect in all industries .

After calculating all parameters and cost we can save 11000 sec/shift (183 min/shift) and that will improve production per shift compare to old system and also reduce operating cost will save 438000 Rs/annum

REFERENCES

[1] Snehal Patel, Review on design and analysis of bucket conveyor.
[2] Barge P.R, Design optimization of roller chain link plate used in sugar industry.
[3] I.A Daniya, Design of material handling equipment. Belt conveyor for crushed lime stone using three roller idler.
[4] Marlon Herrera mazauera, Pipe conveyor and belt.
[5] Daniel J. Fonseca, A knowledge based system for conveyor equipment selection.
[6] Lijun zhang, A design approach for multiple drive belt conveyor minimizing life cycle cost.
[7] Brandau, Short history of stretch blow molding.
[8] Samuel L. belcher, Blow molding
[9] Dr. A R Sahu Pradnyatna, Design, Modeling and Analysis of conveyor system used for transportation of cartons.
[10] http://www.vikramplast.com/aboutus.htm sci-hub.com
[11] https://www.sciencedirect.com/search/advanced?qs=Blow%20moulding&show=25&sort By=relevance https://smallseotools.com/plagiarism-checker/
[12] https://www.pmms.gtu.ac.in/Student/MyAccount/BE7DashBoardForStudent https://patents.google.com
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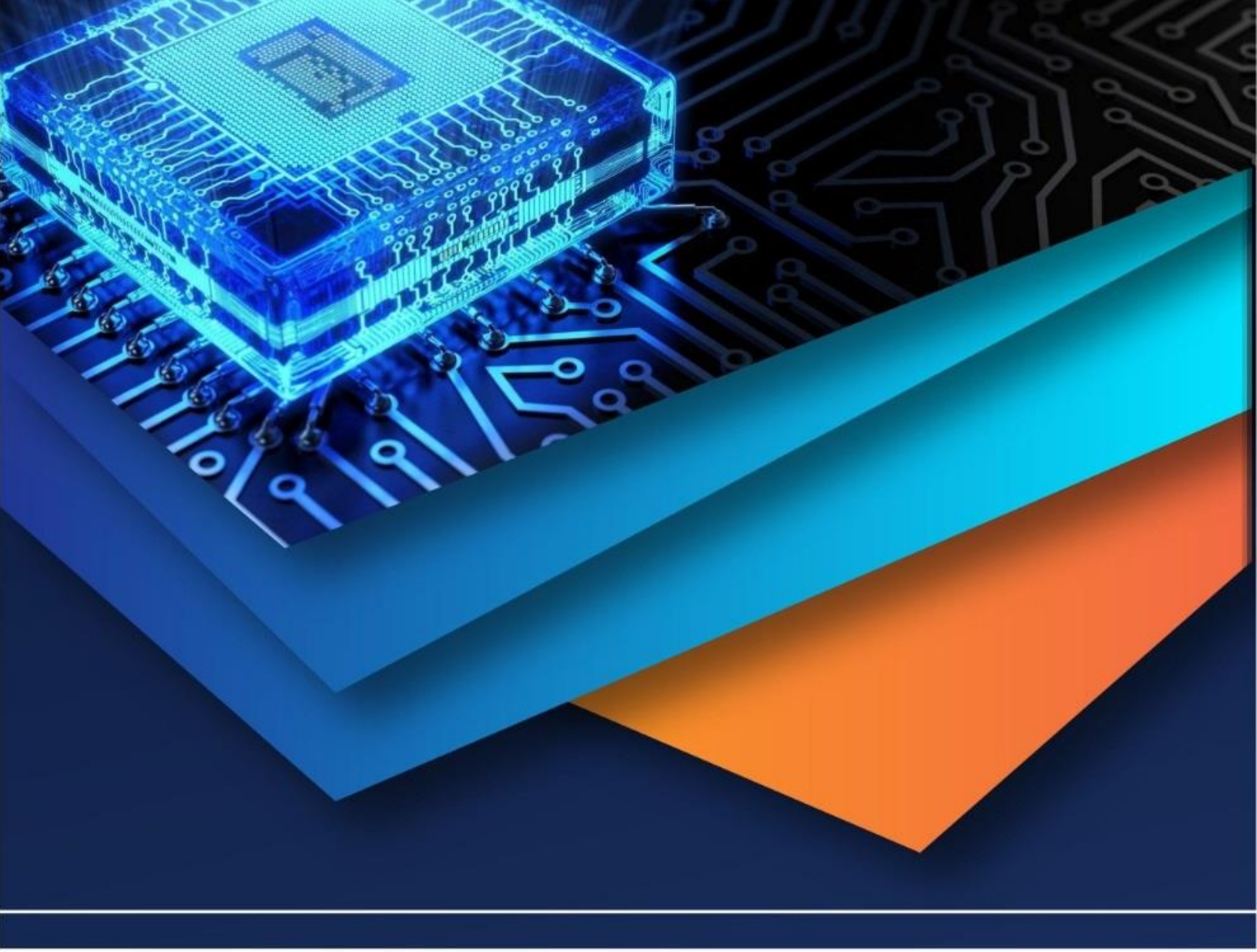
[14] https://www.academia.edu/6024127/Research_Paper_Engineering_Plastic_Injection_M olding_with_Taguchi_Approach_-A_Review
[15] https://www.researchgate.net/publication/303370291_A_Brief_Review_on_injection_mo ulding_manufacturing_process
[16] https://www.researchgate.net/publication/289868197_IMPROVEMENT_OF_MECHANIS M_OF_CONVEYOR_SYSTEM_PART_5
[17] https://www.researchgate.net/publication/251932727_The_research_on_boiler_drum_w ater_level_control_system_based_on_self-adaptive_fuzzy-PID/amp
[18] https://www.academia.edu/6024127/Research_Paper_Engineering_Plastic_Injection_M olding_with_Taguchi_Approach_-A_Review
[19] https://www.google.com/search?q=dme+vb+bhandari&oq=dne+vb+&aqs=chrome.1.69i5 7j0.4971j0j4&client=ms-android-xiaomi&sourceid=chrome-mobile&ie=UTF-8



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