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Performance Study of Effluent Treatment Plant of M/S Harshit Textile Industry, Gwalior (M.P.)

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Abstract: ***Textile industries are the most water consuming industries. Wet processes of this industry create extremely variable nature of effluent and results in a risk to the environment mainly pollution of water bodies is a major concern. Deterioration of ecosystem is caused by quick disposal of untreated effluent into various water bodies; which further damage the aquatic life. To battle natural debasement it is obligatory for a material colouring industry to introduce a powerful emanating treatment plant (ETP). Ineffectively treated wastewater with elevated level of toxins brought about by poor plan, activity or treatment frameworks makes major ecological issues when released to the surface land or water. The current study has been carried out for analysing the performance appraisal of Effluent Treatment Plant (ETP) of M/S Harshit Textile industry located at Birla Nagar, Gwalior (M.P.). This ETP handles 300 KLD of effluent and has 400 KLD capacity; it is working on methodology of biological treatment i.e. extended aeration activated sludge system followed by tertiary treatment plant (R.O). Wastewater is analysed for major characteristics like pH, Chemical Oxygen Demand (COD), Biological Oxygen Demand (BOD), Total Dissolved Solid (TDS), Total Suspended Solid (TSS) and Alkalinity. Samples were collected from inlet and outlet of ETP on a monthly basis for a 5 month period and tested. The study of test results depicted that the mean concentration of B.O.D., C.O.D., T.D.S., T.S.S. and Alkalinity in the effluent from the ETP were 29.8 mg/l, 227.4 mg/l, 372.2 mg/l, 77mg/l and 21 mg/l respectively, which fulfilled the emanating guidelines for all the above portrayed parameters as per the CPCB guidelines standards for textile effluent. It is discovered that organic wastewater treatment has high level of effectiveness with least running cost (5 to multiple times less) contrasted with different techniques. The mean Removal Efficiency of B.O.D., C.O.D., T.D.S., T.S.S. and Alkalinity is found out to be 92.4%, 82.4%, 87.4%, 90.2% and 78.8% respectively by the ETP.***

Keywords: Textile, Effluent, Performance, Efficiency, Wastewater.

I. INTRODUCTION

Indian economy's one of the best player is the textile industry. It has provided a huge number of employments to the countrymen, giving 5% of GDP (Gross Domestic Product), 17% of export and around 19% of industrial production. It has given 9% of excise collection, 30% of revenue from export and 18% of industrial sector employment. It accounts to 12% of total country's export and has been India's largest earners of foreign trade.

Harshit textile industry was renamed in 2002, earlier it was titled Grasim. However it shut down in 2003 and re-opened in 2009 with staff almost reduced to half. It is a wet processing industry unit i.e. manufactured cloth from Bhiwadi is transported here to Harshit Textile Industry for further processes like bleaching, dyeing, folding, packaging etc.

Textile industry being the largest industries in the world in which variety of fibres such as silk,cotton, wool as well as synthetic fibres; all are coloured, processed, pretreated and treated using huge amounts of water and different types of chemicals. Hence there is a need to learn the chemistry of textile effluents precisely.The textile waste characteristic needs to be understood clearly.

It being having very high potential for contaminating water and air; is also one of the profoundly contaminating enterprises in the state. Air pollution is mainly caused by the following sources - thermo pack, boilers and Diesel Generator(s) that emit gaseous pollutants such as sulphur di oxide gas, oxide of nitrogen gas and suspended particulate matter (SPM). The significant functions carried out in a typical textile processing industry are scouring, desizing, neutralizing, bleaching, mercerising, printing, dyeing and finishing. The release of dirtied effluents and utilization of different raw materials may cause adulteration of soil, ground water and surface water which may have negative impact on the environment and specifically the public.

In secondary system of ETP the effluents generated are un-fit for disposal on land or surface water. Thus, to meet the BIS standards for discharging effluents; tertiary treatment systems are made mandatory. Now days, the most commonly used treatment at the end of ETP for the eradication of dissolved salts and organic matter are membrane build processes like ultra-filtration, nano filtration and Reverse Osmosis (R.O). Another option for tertiary treatment is ozonisation; it is specially used for oxidation of inorganic and organic matter, decolonization and deodorization in textile industries.

Different methods and aspects of Textile Effluents and its management to save the environment from polluting the same need to be understood. For the evolution of nil discharge solution by the dyeing and bleaching units; all nations are targeting at the Common Effluent Treatment Plants. On the basis of effluents generated in these mills and the mill size; the total effluent treatment capacity is designed.

Dyes used are non-biodegradable, however bleaches, detergents, other chemicals and some synthetic organic dyes are biodegradable starch. Hence the effluent has higher BOD and COD due to lower dissolved oxygen concentration. Various process chemicals and fibrous substrate leads to presence of solids in textile wastewater which abrupt the aquatic life by reducing light entrance and showing oxygen exchange.

Significant local water pollution is caused due to discharge of huge amount of weakly treated or untreated wastewater from many factories; which have quickly grown without any planning. Hence the outcome of this is decreased productivity of agricultural land and water bodies; further threatening the biodiversity of the ecosystem.

Thus apart from environmental humiliation there is a deduction in the incomes and nutrition of families which are ethically dependent on these resources; and they may not be the same public which get the benefit from the jobs generated by these factories.

One way to reduce environmental degradation is to properly treat the effluent before discharging. Analysis of the environmental characteristics of the effluent will have a precise idea on performance evaluation of ETP and to prevent adverse impact on the environment necessary measures may be taken. The individual efficiency of units of an effluent treatment plants determines the final effluent quality and the overall performance of the plant. Although industries already having ETPs, often show unwillingness in correctly operating the plant because of the lack in experience and huge running cost to do so effectively. Fig.1 shows the Wet Processing at M/S Harshit Textile Industry.

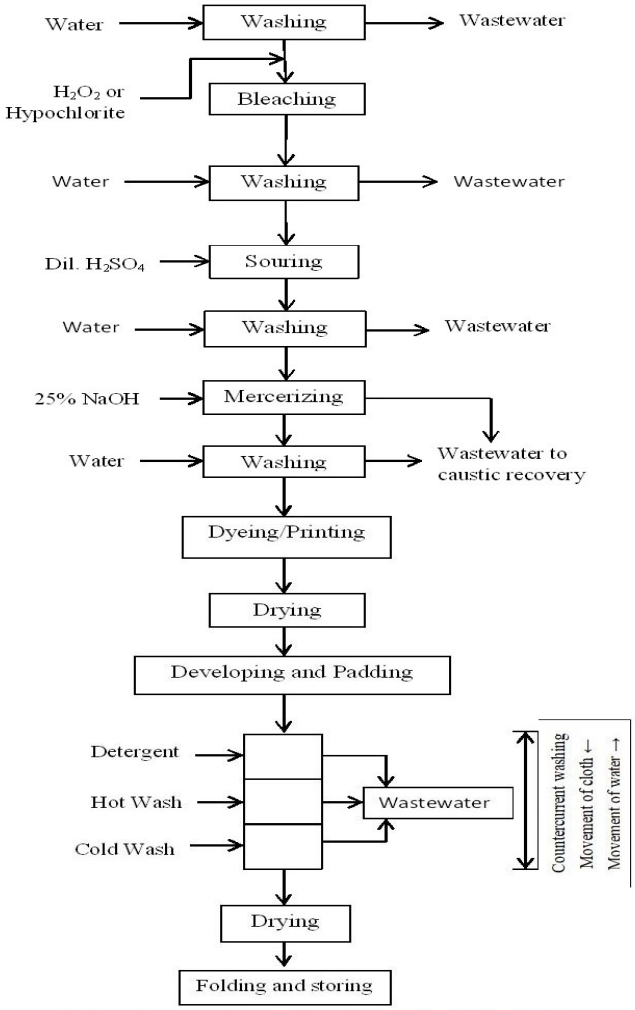


Figure 1 Wet Processing at M/S Harshit Textile Industry

II. METHODOLOGY

The object of my work is to study the polluting characteristics of wastewater generated from the textile industry and to check whether the ETP is working with designed efficiency or not. Inside this view, the test work has been planned and is introduced here with:

A. Work Plan – An Overview

Collection of samples was done for five months March, April, May, July and August from the inlet and outlet of the ETP, at least once in a month and characterize for parameters BOD, pH, COD, Alkalinity , TDS etc.

B. Study Area(ETP) – An Overview

Harshit Textile Industry is located at Birla Nagar in Gwalior (M.P.). The processing of the industry includes receiving completely manufactured dry cotton-polyester mix cloth from Bhiwadi and then undergoing it through wet processing. Beginning with Bleaching then washing, Souring then washing, Mercerizing then washing, dyeing or printing then drying, Developing and Padding, Counter current washing then drying and Finally Folding and Storing. All the washing as mentioned earlier results is the generation of Wastewater which is discharged to a common drain leading to the ETP of the Harshit Textile Industry.

The ETP of Harshit Textile Industry having a capacity of 400 KLD of wastewater was selected for the study. A systematic flow diagram of ETP is shown in Fig. 2. It comprises of chemical treatment in which Poly aluminium Chloride (PAC) and lime was used as a coagulant followed by biological treatment which is operating on extended aeration activated sludge system along with a tertiary treatment plant where Reverse Osmosis (RO) unit is provided. The effluent samples were collected from each units of ETP (equalization, flocculation, PST [Primary Settling Tank], Aeration, SST [Secondary Settling Tank] and RO.

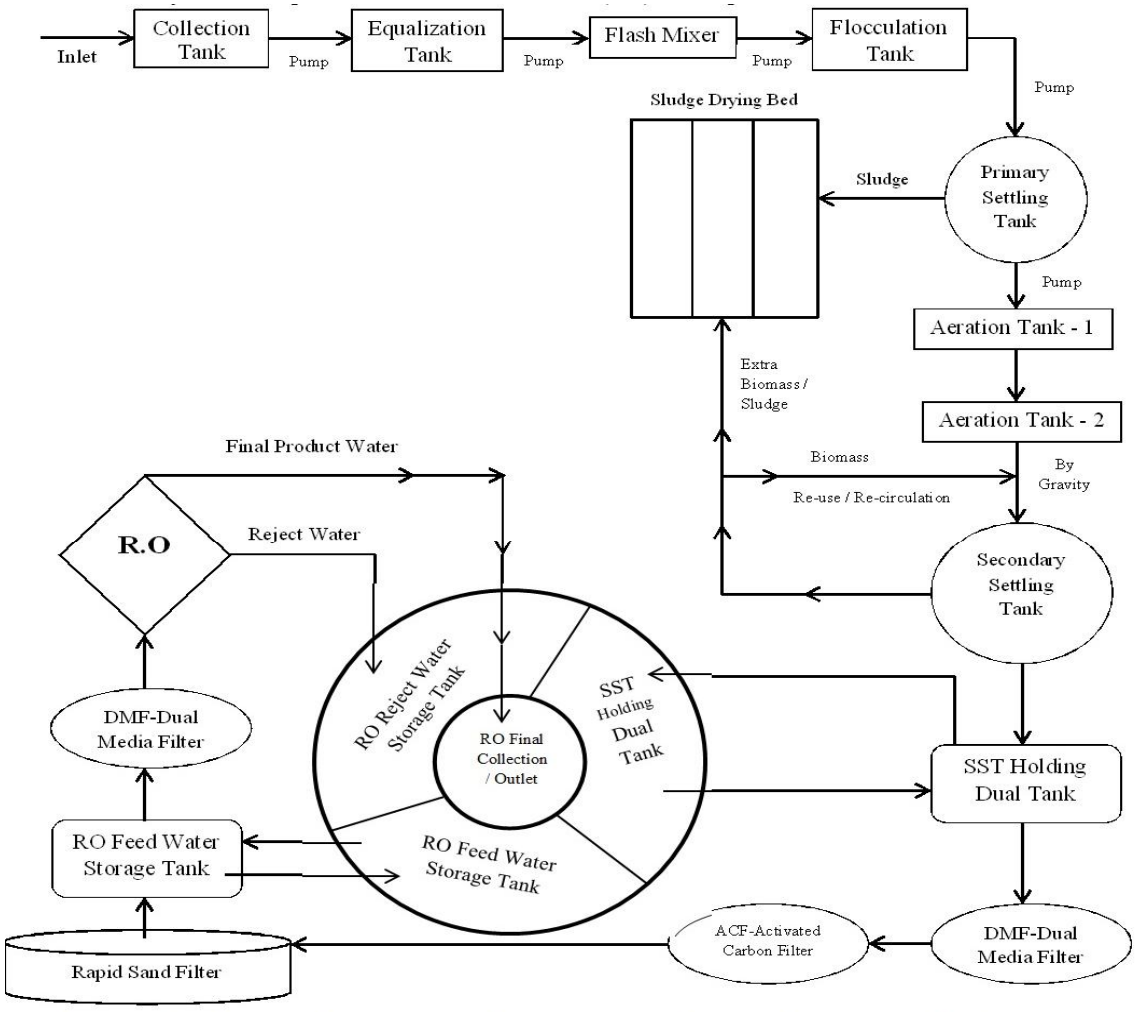


Figure 2 Flow Diagram of ETP at M/S Harshit Textile Industry

C. Sample Collection

Sample collection was done in plastic bottles, prior to collection it was properly cleaned with hydrochloric acid and washed with tap water to render free of acid. The sample bottle was then labelled and its pH was also checked at site with pH paper. The effluent samples were preserved under 4°C till the testing was done.

Sample collection was done from the inlet and outlet points of the ETP. The collected samples were analysed for pH, Biochemical Oxygen Demand (B.O.D), Alkalinity, Total Dissolved Solids (T.D.S), Chemical Oxygen Demand (C.O.D), Total Suspended Solids (T.S.S and Total Solids (T.S).

III. OBSERVATIONS

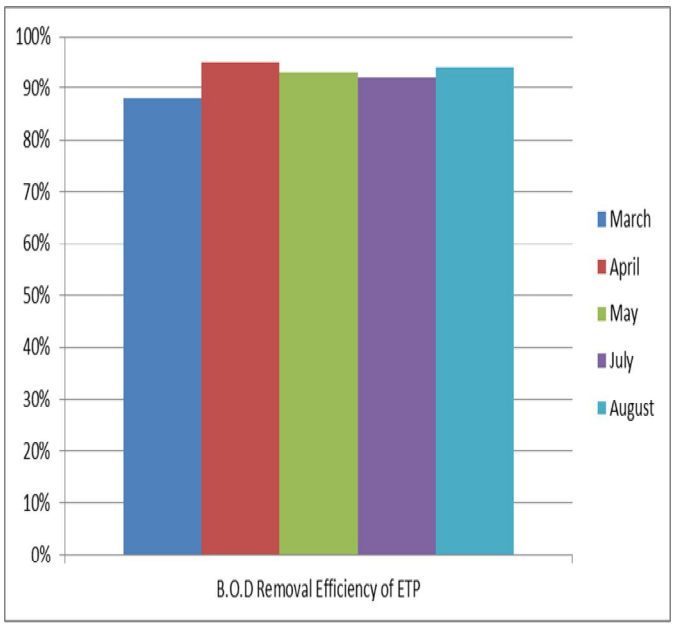
TABLE I
Characterstics Of Influent And Effluent

Parameters	INFLUENT					EFFLUENT				
	March	April	May	July	August	March	April	May	July	August
pH	7.7	7.5	8	7.4	7	7.1	8.2	7.5	8	7
B.O.D	360	620	428	343	320	44	30	29	26	20
C.O.D	1069	1541	1871	1275	968	180	322	212	191	232
T.D.S	2500	2112	2990	3459	3671	286	304	424	378	469
T.S.S	750	832	659	953	786	84	79	86	65	71
ALKALINITY	118	126	97	105	52	20	34	23	16	12

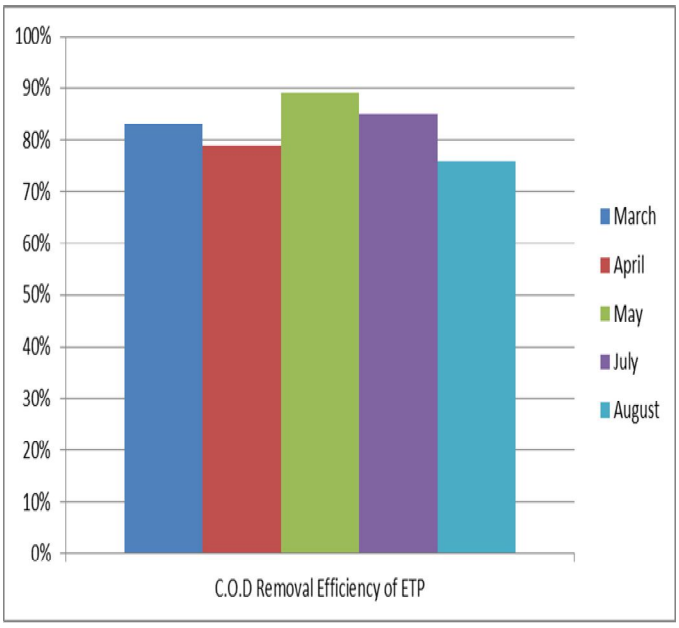
Note – All Characteristics except pH are in mg/l.

Table 2 Removal Efficiency of ETP

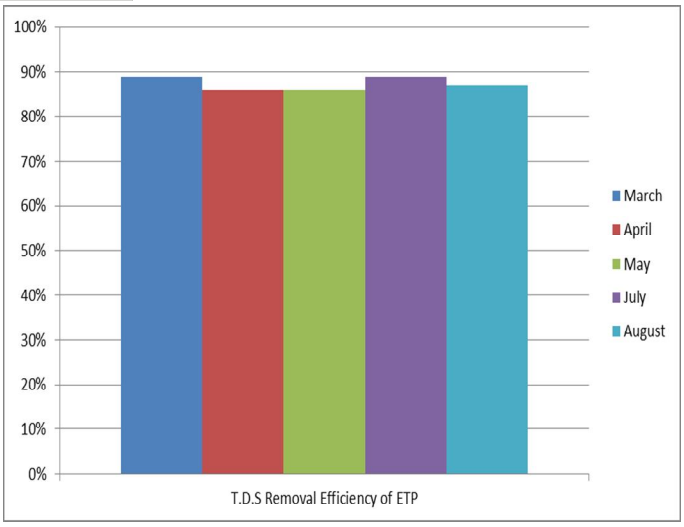
Parameters	March	April	May	July	August
B.O.D	88%	95%	93%	92%	94%
C.O.D	83%	79%	89%	85%	76%
T.D.S	89%	86%	86%	89%	87%
T.S.S	89%	91%	87%	93%	91%
ALKALINITY	83%	73%	76%	85%	77%



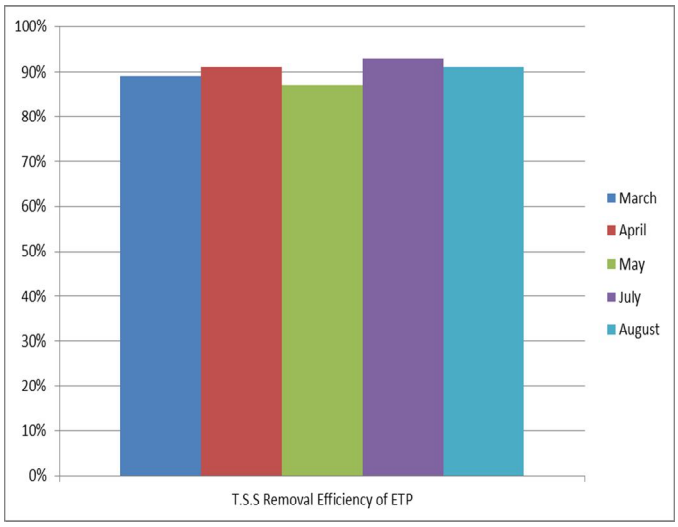
Graph 1- Graph showing B.O.D Removal Efficiency of ETP



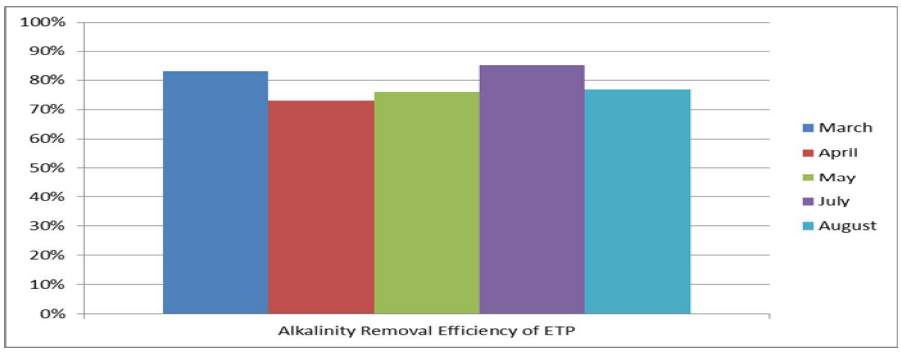
Graph 2- Graph Showing C.O.D Removal Efficiency of ETP



Graph 3- Graph Showing T.D.S Removal Efficiency of ETP



Graph 4- Graph Showing T.S.S Removal Efficiency of ETP



Graph 5- Graph Showing Alkalinity Removal Efficiency of ETP

IV. RESULTS AND DISCUSSION

According to the Madhya Pradesh Pollution Control Board (M.P.P.C.B.) every industry must improve their pollution control facilities and maintain them properly so that the treated effluents meet the prescribed standards.

It also states that every industry uses their treated effluent within its premises for plantation or horticulture or re use it in their processing units. And no industry in any case shall discharge any effluent outside the factory premises in any circumstances and zero discharge condition shall be maintained.

Harshit Textile industry truly satisfies the M.P.P.C.B norms. ETP setup of Harshit Textile industry is working efficiently as the test results depicted that the mean concentration of B.O.D., C.O.D., T.D.S., T.S.S. and Alkalinity in the effluent from the ETP were 29.8 mg/l, 227.4 mg/l, 372.2 mg/l, 77mg/l and 21 mg/l respectively, which met the CPCB guidelines standards for textile effluents for all the above described parameters.

CPCB guidelines standards for textile effluent are given in the following Table no.-3:-

TABLE 3
Effluent Wastewater From Etp And Standard Effluent Quality Guidelines

PROPERTIES	EFFLUENT FROM ETP	STANDARD GUIDELINES
B.O.D.	29.8 mg/l	< 30 mg/l
C.O.D.	227.4 mg/l	< 250 mg/l
pH	7-9	5.5 – 9
T.D.S.	372.2 mg/l	< 2100
T.S.S.	77 mg/l	< 100 mg/l
ALKALINITY	21 mg/l	-

V. CONCLUSIONS

A. The Performance Study Of this ETP of Textile Industry and the usage of effluent back in the industry processing is really commendable. The study of test results depicted that the average concentration of B.O.D., C.O.D., T.D.S., T.S.S. and Alkalinity in the effluent coming from the ETP were 29.8 mg/l, 227.4 mg/l, 372.2 mg/l, 77mg/l and 21 mg/l respectively, which met the CPCB guidelines standards for textile effluents for all the above described parameters

B. The mean Removal Efficiency of B.O.D., C.O.D., T.D.S., T.S.S. and Alkalinity is found out to be 92.4%, 82.4%, 87.4%, 90.2% and 78.8% respectively by the ETP. Hence, it is an ideal industry with an ideal ETP which is functioning up to the mark and is an ideal example for the society. It is discovered that biological wastewater treatment has high level of effectiveness with least running cost (5 to 6 times less) contrasted with different techniques.

C. As per the 5 months data figured out, current ETP seem competent of withstanding the shock loads without its efficiency being affected. Various units are also performing well separately; showing satisfactory removal efficiencies. Hence this ETP working on the principle of activated sludge process is found to be potential plant for industrial wastewater treatment.

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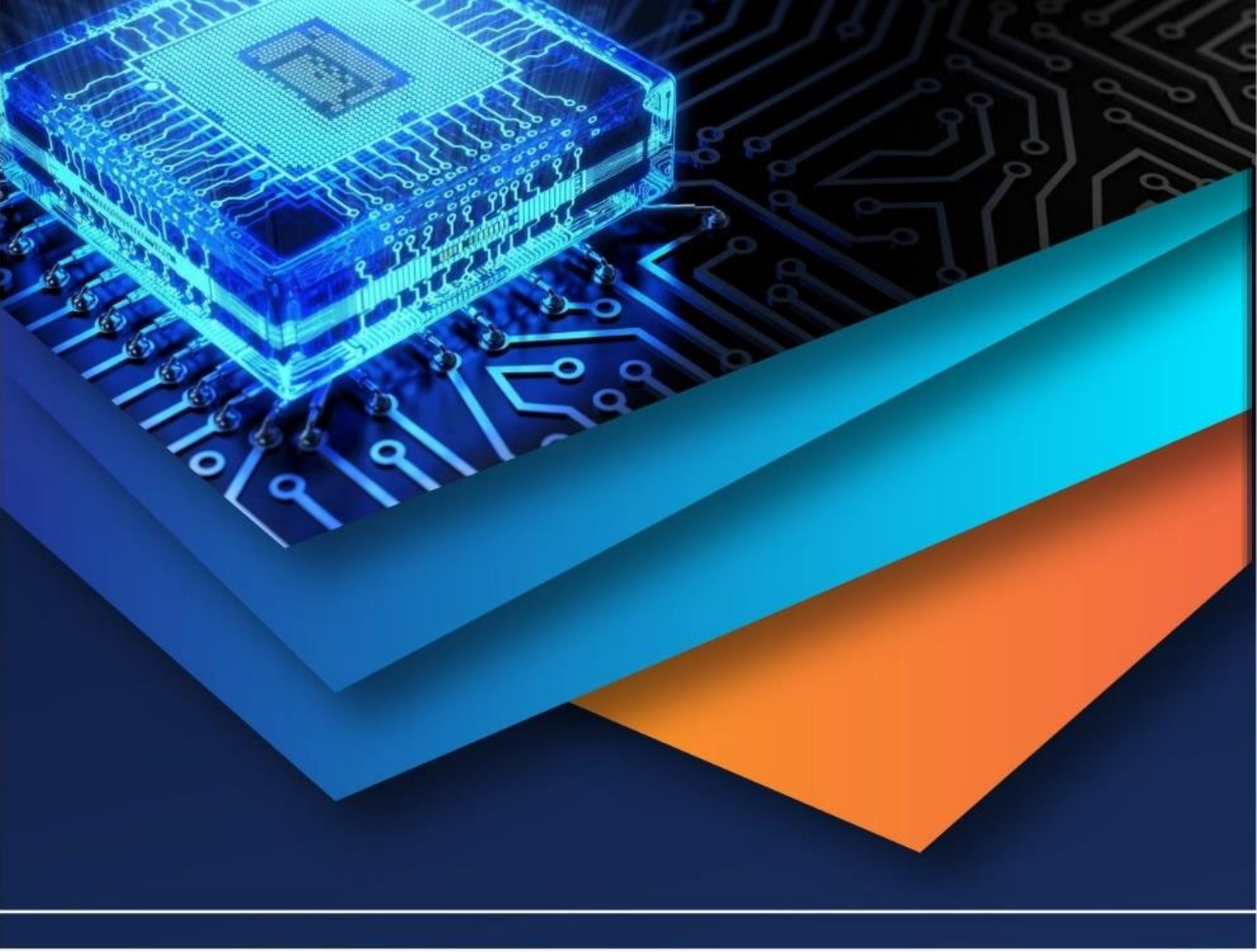

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