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A Field Study of the Environmental Pollution Resulting from Quarries and Crushers in Sukna-Al-Jafra

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Abstract: ***Throughout the ages the surrounding environment has been intentionally or unintentionally polluted. Since the fire was discovered, the human used it for his own purposes such as: cooking, smelting metals, lighting, heating, burning forests, and other types of uses that pollute the environment. With the emergence of industrial and civil development, environmental pollution began to increase in a way that poses a threat to human health and life. This necessitated attention to the presence of evidence indicating that it has begun to threaten all creatures on the surface of the globe. The study was an attempt to shed light on the environmental pollution resulting from quarries and crushers, and to find successful solutions to achieve a broader understanding of environmental conservation with conducting a field study to find out the percentage of air pollutants in the study area (quarries and crushers in Sukana). As well as introducing the dangers of air pollution on the surrounding environment and finding correct scientific foundations in accordance with the Libyan laws, regulations and legislation that regulate the sites of quarries and crushers. In addition, to know the fate of the natural environment which that surrounding of crushers in the current situation and the role of climatic elements in transporting pollutants to the air. And to contribute to the establishment of a database in the field of environmental studies to assess its effects in the Al-Jufra region and to find solutions and recommendations to control environmental pollutants at quarries and crushers sites.***
Keywords: Environmental, Pollution, Crushers, Sukna, Al-Jafra.

I. INTRODUCTION

Population and urban development, along with the scientific and technical development and the great growth in building and construction projects in which building materials are used from nature, have necessitated the emergence of various industrial economic activities, including quarries and crushers that exploit stones for the purpose of producing the rubble inside the building and construction processes. From this point of view, air pollution has been associated with the operation of these facilities, as quarries and crushers are considered among the industrial activities that result in significant environmental pollutants. The most important of these are dust and dirt resulting from technological processes for producing aggregates. If this polluted dust is not seized and prevented from spreading in the air, it leads to deformation and denudation of the soil in addition to the death of plants in the valley, with the possibility of impeding traffic and transportation.

It was found through field visits that the number of these crushers in the study area reached 34 for the production of aggregates and other building materials. It was also found that the average production of crushers of aggregates needed for building and construction is about 300-700 m^3/day, depending on the type and nature of aggregates required in the market. The average size of each crusher is about 1-4 ha. The raw materials are close to the crushers with a distance of about 50-500 m. The quality of the stone used is considered a solid igneous rocks resulting from magma emanating from volcanoes from past years. It is extracted from the depths of the valley near the crushers, which were formed as a result of soil erosion by rain and wind. As these rocks were transported through geological times gone and keep submerged in the ground until extracted. And have a very high degree of hardness.

II. RESEARCH PROBLEM

Based on the frequent scientific bulletins from the specialized authorities and those interested in the environment about the danger of environmental pollution in the areas near the crushers in a striking way, everyone who is concerned and has an interest in the environment and knowing the seriousness of the problem that resulted from the randomness of quarries and crushers in the absence of monitoring stations and monitoring of environmental pollution resulting from them Bsukna. The study area is considered an agricultural area. It was also noted that important plants such as palms and olives were affected and drought, and acacia, which is known for its severe drought tolerance, with frequent impacts on the environment surrounding the site of quarries and quarries.

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The problems and the seriousness of environmental pollution resulting from crushers in addition to not being effectively regulated lead to imperative to direct studies and research to the problem of environmental pollution resulting from the production of rubble and the negative problems that resulted from it, destructive to the surrounding natural environment. Therefore, the topic of preparing a field study of environmental pollution resulting from quarries and crushers in the city of Sukna - Al-Jafra was raised by a specialized committee of professors of the Higher Institute for Comprehensive Professions Al-Jufra and students of the graduation project in the Environmental Engineering and Water Resources Division.

III. THE LOCATION OF THE STUDY AREA

Sukna Oasis, along with the cities of Hun, Wadan, and Zillah, and Alfugha, formed a geographical area known as the Jufrah Depression. The city of Sukna is located at latitude of 92o 40' 44" North and longitude 51o84' 03" East. It rises 315 meters above sea level. It can be said that this oasis is located in a low frame, despite it's slightly deviation in the southwest direction. The city of Sukna is the southern gateway to the oases of the Jufra depression, as it is located in a vast plain extending to the east. Its total area is approximately 2000 km2. Sukna is located in the south of Sirt, like the neighboring oases, at a distance of 250 km. In the southeast the city of Tripoli which is distanced approximately 635 km. It is located in the northeastern direction of Murzuq, at a distance of 415 km. On the north side, it is bordered by the Wadan and Hun Mountains and the east, which are considered natural borders. As for the west, it is bounded by Hamada Al-Hamra and sand dunes that formed a natural protection for it. The southern area of the region abounds in black heights formed from cold volcanic agglomerations for many years, which are the main support for the construction of crushers and quarries on them in large quantities.

IV. MEASURING THE PERCENTAGE OF AIR POLLUTION IN THE STUDY AREA

The percentage of air pollution with dust resulting from quarries and crushers was measured in the study area accompanied by a specialized technical team from the General Authority for the Environment in Libya. The samples have been taken in the study area consisting of from the 8 readings at separate places in the region, and the results of these readings were as follows:

Table 1
Summary report at the main road between the crushers

Report File:	C:\Program Files\Casella Group Ltd\Win Dust Pro\MicroDust-01-03-2011-00.dat	
Start:	10:27:23 1/3/2011	
End:	10:30:48 1/3/2011	
File Calibration:	Unmodified	
Concentration Statistics		
Max:	1.718 mg/m^3	(At 10:29:33 on 1/3/2011)
Min:	0 mg/m^3	(At 10:27:33 on 1/3/2011)
Average	0.433 mg/m^3	

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Date	Time	mg/m^3	$\mu g/ m^3$
1/3/2011	10:27:23	0.452	452
1/3/2011	10:27:28	0.057	57
1/3/2011	10:27:33	0	0
1/3/2011	10:27:38	0.207	207
1/3/2011	10:27:43	0.314	314
1/3/2011	10:27:48	0.377	377
1/3/2011	10:27:53	0.276	276
1/3/2011	10:27:58	0.024	24
1/3/2011	10:28:03	0.321	321
1/3/2011	10:28:08	0.224	224
1/3/2011	10:28:13	0.396	396
1/3/2011	10:28:18	0.288	288
1/3/2011	10:28:23	0.379	379
1/3/2011	10:28:28	0.206	206
1/3/2011	10:28:33	0.217	217
1/3/2011	10:28:38	0.17	17
1/3/2011	10:28:43	0.21	21
1/3/2011	10:28:48	0.142	142
1/3/2011	10:28:53	0.303	303
1/3/2011	10:28:58	0.534	534
1/3/2011	10:29:03	0.514	514
1/3/2011	10:29:08	0.502	502
1/3/2011	10:29:13	0.559	559
1/3/2011	10:29:18	0.55	55
1/3/2011	10:29:23	0.618	618
1/3/2011	10:29:28	1.491	1491
1/3/2011	10:29:33	1.584	1584
1/3/2011	10:29:38	1.451	1451
1/3/2011	10:29:43	0.544	544
1/3/2011	10:29:48	0	0
1/3/2011	10:29:53	0.606	606
1/3/2011	10:29:58	0.239	239
1/3/2011	10:30:03	0	0
1/3/2011	10:30:08	0.312	312
1/3/2011	10:30:13	0.884	884
1/3/2011	10:30:18	0.539	539
1/3/2011	10:30:23	0.646	646
1/3/2011	10:30:28	0.625	625
1/3/2011	10:30:33	0.599	599
1/3/2011	10:30:38	0.341	341
1/3/2011	10:30:43	0	0
1/3/2011	10:30:48	0.502	502

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Table 2
Summary report at the end of crushers (Valley)

Report File:	C:\Program Files\Casella Group Ltd\WinDust Pro\MicroDust-03-01-2011-01.dat	
Start:	10:43:00 1/3/2011	
End:	10:45:45 1/3/2011	
File Calibration:	Unmodified	
Concentration Statistics		
Max:	0.321 mg/m^3	(At 10:44:47 on 1/3/2011)
Min:	0 mg/m^3	(At 10:43:00 on 1/3/2011)
Average	0.016 mg/m^3	

Date	Time	mg/m^3	µg/ m^3
1/3/2011	10:43:00	0	0
1/3/2011	10:43:05	0.059	59
1/3/2011	10:43:10	0.04	4
1/3/2011	10:43:15	0.039	39
1/3/2011	10:43:20	0.005	5
1/3/2011	10:43:25	0	0
1/3/2011	10:43:30	0	0
1/3/2011	10:43:35	0	0
1/3/2011	10:43:40	0.001	1
1/3/2011	10:43:45	0.012	12
1/3/2011	10:43:50	0.005	5
1/3/2011	10:43:55	0.009	9
1/3/2011	10:44:00	0.012	12
1/3/2011	10:44:05	0	0
1/3/2011	10:44:10	0	0
1/3/2011	10:44:15	0.002	2
1/3/2011	10:44:20	0	0
1/3/2011	10:44:25	0.006	6
1/3/2011	10:44:30	0.002	2
1/3/2011	10:44:35	0	0
1/3/2011	10:44:40	0.002	2
1/3/2011	10:44:45	0.001	1
1/3/2011	10:44:50	0.075	75
1/3/2011	10:44:55	0.003	3
1/3/2011	10:45:00	0.02	2
1/3/2011	10:45:05	0.002	2
1/3/2011	10:45:10	0.013	13
1/3/2011	10:45:15	0.117	117
1/3/2011	10:45:20	0.008	8
1/3/2011	10:45:25	0.014	14
1/3/2011	10:45:30	0.017	17
1/3/2011	10:45:35	0.023	23
1/3/2011	10:45:40	0.032	32
1/3/2011	10:45:45	0.014	14

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Table 3
Summary Report on the highway in front of the rest area of the AFIA project

Report File:	C:\Program Files\Casella Group Ltd\WinDust Pro\MicroDust-03-01-2011-02.dat	
Start:	10:54:13 1/3/2011	
End:	10:57:13 1/3/2011	
File Calibration:	Unmodified	
Concentration Statistics		
Max:	0.341 mg/m^3	(At 10:56:19 on 1/3/2011)
Min:	0 mg/m^3	(At 10:54:28 on 1/3/2011)
Average	0.009 mg/m^3	

Date	Time	mg/m^3	µg/ m^3
1/3/2011	10:54:13	0.002	2
1/3/2011	10:54:18	0.006	6
1/3/2011	10:54:23	0.029	29
1/3/2011	10:54:28	0	0
1/3/2011	10:54:33	0	0
1/3/2011	10:54:38	0	0
1/3/2011	10:54:43	0.001	1
1/3/2011	10:54:48	0	0
1/3/2011	10:54:53	0.007	7
1/3/2011	10:54:58	0	0
1/3/2011	10:55:03	0.003	3
1/3/2011	10:55:08	0.001	1
1/3/2011	10:55:13	0	0
1/3/2011	10:55:18	0	0
1/3/2011	10:55:23	0.016	16
1/3/2011	10:55:28	0	0
1/3/2011	10:55:33	0	0
1/3/2011	10:55:38	0	0
1/3/2011	10:55:43	0.021	21
1/3/2011	10:55:48	0.001	1
1/3/2011	10:55:53	0	0
1/3/2011	10:55:58	0	0
1/3/2011	10:56:03	0	0
1/3/2011	10:56:08	0.012	12
1/3/2011	10:56:13	0.002	2
1/3/2011	10:56:18	0.034	34
1/3/2011	10:56:23	0.14	14
1/3/2011	10:56:28	0.019	19
1/3/2011	10:56:33	0	0
1/3/2011	10:56:38	0.003	3
1/3/2011	10:56:43	0.002	2
1/3/2011	10:56:48	0.005	5
1/3/2011	10:56:53	0	0
1/3/2011	10:56:58	0	0
1/3/2011	10:57:03	0.003	3
1/3/2011	10:57:08	0	0
1/3/2011	10:57:13	0.019	19

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Table 4
Summary report on farms, about 3 km behind the crushers

Report File:		C:\Program Files\Casella Group Ltd\WinDust Pro\MicroDust-03-01-2011-03.dat
Start:		11:20:44 1/3/2011
End:		11:24:29 1/3/2011
File Calibration:		Unmodified
Concentration Statistics		
Max:	0.032 mg/m^3	(At 11:23:17 on 1/3/2011)
Min:	0 mg/m^3	(At 11:20:44 on 1/3/2011)
Average:	0.001 mg/m^3	

Date	Time	mg/m^3	$\mu g/m^3$
1/3/2011	11:20:44	0	0
1/3/2011	11:20:49	0	0
1/3/2011	11:20:54	0	0
1/3/2011	11:20:59	0	0
1/3/2011	11:21:04	0.001	1
1/3/2011	11:21:09	0	0
1/3/2011	11:21:14	0	0
1/3/2011	11:21:19	0	0
1/3/2011	11:21:24	0.001	1
1/3/2011	11:21:29	0	0
1/3/2011	11:21:34	0	0
1/3/2011	11:21:39	0	0
1/3/2011	11:21:44	0	0
1/3/2011	11:21:49	0	0
1/3/2011	11:21:54	0	0
1/3/2011	11:21:59	0	0
1/3/2011	11:22:04	0	0
1/3/2011	11:22:09	0	0
1/3/2011	11:22:14	0	0
1/3/2011	11:22:19	0	0
1/3/2011	11:22:24	0	0
1/3/2011	11:22:29	0	0
1/3/2011	11:22:34	0.001	1
1/3/2011	11:22:39	0	0
1/3/2011	11:22:44	0	0
1/3/2011	11:22:49	0	0
1/3/2011	11:22:54	0	0
1/3/2011	11:22:59	0	0
1/3/2011	11:23:04	0	0
1/3/2011	11:23:09	0	0
1/3/2011	11:23:14	0.003	3
1/3/2011	11:23:19	0.012	12
1/3/2011	11:23:24	0	0
1/3/2011	11:23:29	0	0
1/3/2011	11:23:34	0.007	7
1/3/2011	11:23:39	0.001	1
1/3/2011	11:23:44	0	0
1/3/2011	11:23:49	0	0
1/3/2011	11:23:54	0	0
1/3/2011	11:23:59	0	0
1/3/2011	11:24:04	0.003	3
1/3/2011	11:24:09	0	0
1/3/2011	11:24:14	0.002	2
1/3/2011	11:24:19	0.001	1
1/3/2011	11:24:24	0	0
1/3/2011	11:24:29	0.001	1

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Table 5
Summary report in front of the AFIA project management gate

Report File:		C:\Program Files\Casella Group Ltd\WinDust Pro\MicroDust-03-01-2011-04.dat
Start:		11:47:37 1/3/2011
End:		11:48:52 1/3/2011
File Calibration:		Unmodified
Concentration Statistics		
Max:	0.109 mg/m^3	(At 11:48:08 on 1/3/2011)
Min:	0 mg/m^3	(At 11:47:37 on 1/3/2011)
Average:	0.004 mg/m^3	

Date	Time	mg/m^3	µg/ m^3
1/3/2011	11:47:37	0	0
1/3/2011	11:47:42	0	0
1/3/2011	11:47:47	0	0
1/3/2011	11:47:52	0	0
1/3/2011	11:47:57	0	0
1/3/2011	11:48:02	0.019	19
1/3/2011	11:48:07	0.006	6
1/3/2011	11:48:12	0.024	24
1/3/2011	11:48:17	0.005	5
1/3/2011	11:48:22	0.003	3
1/3/2011	11:48:27	0	0
1/3/2011	11:48:32	0	0
1/3/2011	11:48:37	0	0
1/3/2011	11:48:42	0	0
1/3/2011	11:48:47	0	0
1/3/2011	11:48:52	0	0

Table 6:
Summary report the residential compound in Al-Furjan agricultural project, Sukana

Report File:		C:\Program Files\Casella Group Ltd\WinDust Pro\MicroDust-03-01-2011-05.dat
Start:		11:57:29 1/3/2011
End:		11:59:44 1/3/2011
File Calibration:		Unmodified
Concentration Statistics		
Max:	0.144 mg/m^3	(At 11:57:42 on 1/3/2011)
Min:	0 mg/m^3	(At 11:57:29 on 1/3/2011)
Average:	0.002 mg/m^3	

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Date	Time	mg/m^3	$\mu g/ m^3$
1/3/2011	11:57:29	0	0
1/3/2011	11:57:34	0.004	4
1/3/2011	11:57:39	0	0
1/3/2011	11:57:44	0.037	37
1/3/2011	11:57:49	0.001	1
1/3/2011	11:57:54	0.004	4
1/3/2011	11:57:59	0	0
1/3/2011	11:58:04	0	0
1/3/2011	11:58:09	0.001	1
1/3/2011	11:58:14	0	0
1/3/2011	11:58:19	0	0
1/3/2011	11:58:24	0	0
1/3/2011	11:58:29	0	0
1/3/2011	11:58:34	0	0
1/3/2011	11:58:39	0	0
1/3/2011	11:58:44	0	0
1/3/2011	11:58:49	0	0
1/3/2011	11:58:54	0.001	1
1/3/2011	11:58:59	0	0
1/3/2011	11:59:04	0	0
1/3/2011	11:59:09	0	0
1/3/2011	11:59:14	0	0
1/3/2011	11:59:19	0	0
1/3/2011	11:59:24	0	0
1/3/2011	11:59:29	0	0
1/3/2011	11:59:34	0	0
1/3/2011	11:59:39	0.004	4
1/3/2011	11:59:44	0	0

Table 7:
Summary report the secondary road linking Sukana and the agricultural bath project

Report File:		C:\Program Files\Casella Group Ltd\WinDust Pro\MicroDust-03-01-2011-06.dat
Start:		12:15:45 1/3/2011
End:		12:18:15 1/3/2011
File Calibration:		Unmodified
Concentration Statistics		
Max:	0.065 mg/m^3	(At 12:15:53 on 1/3/2011)
Min:	0 mg/m^3	(At 12:15:45 on 1/3/2011)
Average:	0.002 mg/m^3	

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Date	Time	mg/m^3	$\mu g/ m^3$
1/3/2011	12:15:45	0	0
1/3/2011	12:15:50	0.018	18
1/3/2011	12:15:55	0.014	14
1/3/2011	12:16:00	0.001	1
1/3/2011	12:16:05	0.001	1
1/3/2011	12:16:10	0	0
1/3/2011	12:16:15	0	0
1/3/2011	12:16:20	0	0
1/3/2011	12:16:25	0	0
1/3/2011	12:16:30	0	0
1/3/2011	12:16:35	0	0
1/3/2011	12:16:40	0	0
1/3/2011	12:16:45	0	0
1/3/2011	12:16:50	0.013	13
1/3/2011	12:16:55	0	0
1/3/2011	12:17:00	0	0
1/3/2011	12:17:05	0	0
1/3/2011	12:17:10	0	0
1/3/2011	12:17:15	0	0
1/3/2011	12:17:20	0	0
1/3/2011	12:17:25	0	0
1/3/2011	12:17:30	0	0
1/3/2011	12:17:35	0	0
1/3/2011	12:17:40	0	0
1/3/2011	12:17:45	0	0
1/3/2011	12:17:50	0.01	1
1/3/2011	12:17:55	0.005	5
1/3/2011	12:18:00	0	0
1/3/2011	12:18:05	0	0
1/3/2011	12:18:10	0	0
1/3/2011	12:18:15	0	0

Table 8:
Summary report in the city centre of Sukhna

Report File:		C:\Program Files\Casella Group Ltd\Win Dust Pro\MicroDust-03-01-2011-07.dat
Start:		12:24:50 1/3/2011
End:		12:26:15 1/3/2011
File Calibration:		Unmodified
Concentration Statistics		
Max:	0.088 mg/m^3	(At 12:24:55 on 1/3/2011)
Min:	0 mg/m^3	(At 12:24:50 on 1/3/2011)
Average:	0.002 mg/m^3	

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Date	Time	mg/m^3	$\mu g/m^3$
1/3/2011	12:24:50	0	0
1/3/2011	12:24:55	0.01	1
1/3/2011	12:25:00	0.02	2
1/3/2011	12:25:05	0	0
1/3/2011	12:25:10	0	0
1/3/2011	12:25:15	0	0
1/3/2011	12:25:20	0	0
1/3/2011	12:25:25	0	0
1/3/2011	12:25:30	0	0
1/3/2011	12:25:35	0	0
1/3/2011	12:25:40	0	0
1/3/2011	12:25:45	0	0
1/3/2011	12:25:50	0	0
1/3/2011	12:25:55	0	0
1/3/2011	12:26:00	0	0
1/3/2011	12:26:05	0	0
1/3/2011	12:26:10	0	0

Fig 1: Air pollution with dust from crushers in the study area.

Through the field study of environmental pollution resulting from crushers in Sukhna, and taking samples from the air in different locations in the study area that has the ability to measure dust inside and outside the work environment of all kinds up to a size of 2-3 micrometers. And in cooperation with a specialized technical team from the laboratory department at the Environment Public Authority in Libya which it is considered a supervisory advisory body specialized in this field and legally authorized to set the permissible limits of environmental pollutants. Referring to the laboratory administration at the Environment Public Authority in Libya, the permissible limit for exposure to dust in the work environment was 260 micrograms per cubic meter and in the external environment it was specified at 150 micrograms per cubic meter.

V. CONCLUSION

A. By comparing the results obtained with the permissible limits, it was found that the study area was polluted by dust particles at rates exceeding the permissible limits. As the highest rates reached at the middle of the main road linking the cities of Sukna and Sabha ((the site of the crushers)) to 1718 micrograms/m^3. While the limit permitted by the environment public authority is 150 micrograms/m3 this necessitated taking the alert and warning it.

B. The presence of dirt and fog has led to the inability to see through the ground and air roads, which leads to devastating accidents, materially and humanly.

C. Corrosion and erosion of equipment and buildings due to dust, which affects their useful life, and this causes great material losses.

D. Air pollution with solids blocks a large part of the sun's rays, which leads to increased lighting needed for industrial processes, which in turn costs money.

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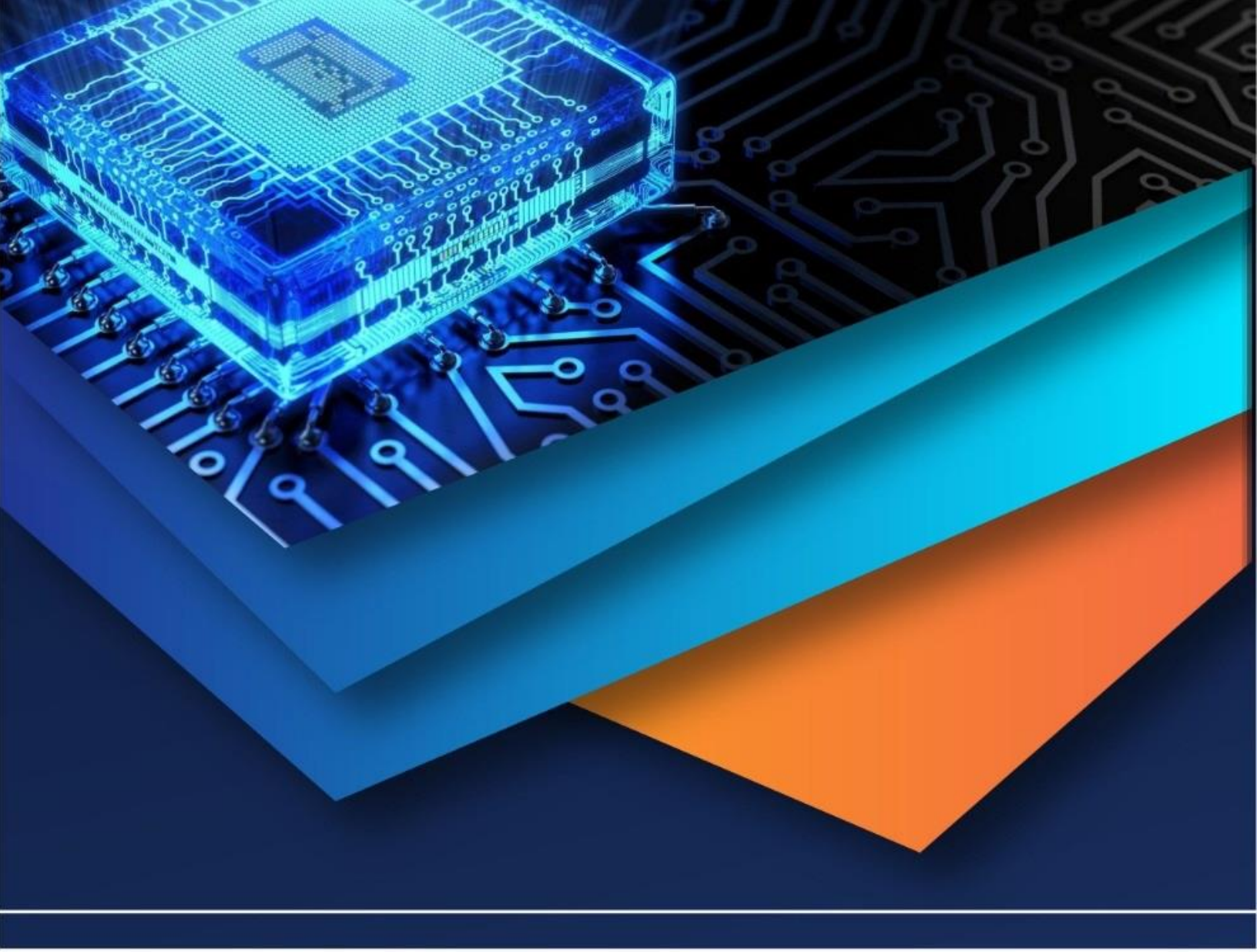

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