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Assessment of Risk Management

Finite Element Model for Prediction

Highlights

Approach of Dredging Disposal

Construction Projects in Afghanistan

Discovering Thoughts, Inventing Future

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Assessment of Risk Management at the Design Stage of Construction Projects in Afghanistan

By Mohammad Alem Wardak & Engineer Madiha Salangyar
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Abstract- In this study, as identified above, the identification of the critical factors afterwards how the management and prevention of possible risks in the design phase of the construction project are investigated, rather than the problems and shortcomings encountered in this phase of the project. Successful completion of this research will help us identify hazardous items in the design phase of construction projects, and what steps should be taken to eliminate or minimize these risks.

Keywords: risk, construction, risk management, afghanistan, risk control, riskology.

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Assessment of Risk Management at the Design Stage of Construction Projects in Afghanistan

Mohammad Alem Wardak [α] & Engineer Madiha Salangyar [σ]

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Keywords: risk, construction, risk management, afghanistan, risk control, riskology.

I. Introduction

The importance of this issue is heightened when the Afghan government has prepared long-term plans for the development of approximately one million affordable housing units with appropriate living standards. Due to the findings of the Ministry of Urban Development and Independent Bureau of Local Authorities, Kabul Municipality and UN Habitat Research, Afghanistan's urban population has been increasing from 20% to 24% due to urban migration in the past two years. In the absence of housing, about 1.5 million have been observed over the years. Kabulas the largest center of internal migration represents 10% annual growth over the past decade, also, sources indicate that 78% of citizens seeking housing are in critical condition, according to the above report, housing problems are one of the most serious social issues in Afghanistan, especially in Kabul. So it is imperative that you pay close attention to this issue and develop comprehensive plans for addressing and resolving this issue and manage it properly. In Afghanistan, risk management will be one of the steps that will help to make these programs a reality. Given the importance of this issue, it requires a comprehensive research to identify the sources of risk and how to manage it realistically, the questions of this research are divided into two types of open and closed questions. These two types of questions are considered as questionnaire and interview form. The questions addressed in the questionnaires are quantitative and closed-ended questions that were scored by the participants. Points are given, that is, by choosing 1 of 5 options, From 1 to 5, respectively, from 5 to 1 enormous.

a) Research Goals in Brief

Identifying the sources of risk
Get comprehensive solutions
Prevent similar occurrences in future projects
Accelerate the design phase of future construction projects

b) When is Risk Analysis needed?

Risk assessment is useful in many situations.

For example:

1. When planning a project, to help predict and neutralize potential problems.
2. When you are deciding to go with a project.
3. When you plan to increase the level of safety and potential risk management in your workplace.
4. Be prepared for events such as equipment and technology failure, theft, employee illness, or natural disasters.

c) How to use Risk Analysis?

To apply the risk analysis, follow these steps:

1. Identify threats

1:1 the first stage of risk analysis is to identify existing and occurring risks. Risks that may be encountered.
1:2 Prepare a list briefly to check that there is a threat or not?
1:3 what are some issues that may harm you?
1:4 Ask people who have different views

2. Risk Assessment

2:1 once you have identified the threats, it is necessary to calculate the probability of the two cases: Threats and their impact. One solution is this: Find the accurate estimate of the probability of occurrence of event, and then multiply this value to the expense of occurrence of the event and doing it right, this will give you a risk value.
2.2 Value of risk = probability of occurrence x cost of occurrence.

As a simple example: Imagine you have identified the risk that rent accommodation to substantially increase: You think that there is 80% chance of this happening next year, because your landlord has recently increased rentals for other businesses. If this happens, next year your business will cost extra $ 500,000.

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So the value of the risk of increased rent equals: 0.8 (probability of occurrence) × 500000 (fee happen) = 400000 (Risk value).

3. How to manage risk

3:1 once you have identified the value of the risk you are facing; you can look for a way to manage it. (Mehta Arjmand, 1396).

4. Divide the risk

4:1 You can also divide the risk with people, Groups, Organizations or other third parties as a result of the possible risks.

For example: When you cover your office building or company property list with insurance of the third party, or when you partner with another organization at the beginning of product development, you have shared the risk with them (Mehta arjmand, 1396).

5. Accept risk

5:1 Your last choice is risk acceptance. This is usually the best option for situations where risk cannot be avoided or mitigated, When the potential risk loss is less than the cost of insurance to prevent risk, or when the potential benefit is at the risk of accepting the risk.

6. Risk control

6:1 if you have chosen a risk-taking solution, there are ways to reduce the impact. Past experiences are effective ways to reduce risk. Experienced managers do risky things in smaller and more manageable dimensions. You can use the results of previous tests to identify the location of the risk and take preventive action before performing large-scale work.

Research Methods: We are trying to clarify the facts and find ways to bring us closer to the goal. The research method of this article is divided into two sections.

1. Questionnaire
2. Interview

The two sections are divided into 5 departments and projects with 60 expert participants. Participants in the two sections of the questionnaire and interview presented their opinions separately. The data were analyzed using SPSS software. Choosing this app to get right and accurate statistics and numbers is intended to make the results work and useful.

1. *Questionnaire:* The questions raised in the questionnaires are as follows.

1. Which of the following is the main cause of the crisis (risk) in the design phase of construction projects?

Table 1

No.	Value	Very low	Low	Medium	Much	Very much
	Number	1	2	3	4	5
1	Lack of unit management in the project					
2	lack of coordination of the project team					
3	Lack of cooperation from related departments or presidency					
4	Lack of work ethics (managerial)					
5	Internal competition (Negative competition)					
6	Lack of transformation management (inability to lead new ways in the project)					
7	Appointing non-technical people in charge					
8	The planning team imbalance in knowledge					
9	Management weaknesses in not recognizing project strengths and weaknesses					
10	Appointment of people with low knowledge level					
11	Change and renewal of plan					
12	Lack of planning and communication in the project					
13	Lack of office facilities to carry out project work					
14	Sophisticated design and detail (Details) inadequate about it					
15	Delay in drawing and issuing drawings					
16	Lack of risk management in projects					
17	Conflict in project priorities					
18	Poorly organized office project					
19	Involvement in many projects at the same time					
20	Vandalism, disruption and unforeseen side effects					
21	Lack of attention to cultural issues and social norms in building design					
22	Inadequate design and plan information for accurate estimation and planning					

23	The lack of a specific timeline for the regular development of design					
24	Poor control of the design flow and its development					

2. Which of the following is the most critical factor in the risk-taking phase of project design?

Table 2

No.	Value		Very low	Low	Medium	Much
	Number	1	2	3	4	5
1	Waste of time					
2	Monetary inflation					
3	The rising prices of materials (market risk)					
4	Exchange rate fluctuations					
5	Delays in project					
6	Canceled project					
7	Poor management's perception of the country and lack of confidence from donors in the future					
8	Failure by donors to read interior design processes					
9	The emergence of the deteriorating security situation					
10	Political changes					

2. *Interview:* The questions in the interview section are as follows:

1. What causes the design process in construction projects to be compromised?
2. What suggestions do you propose to prevent or minimize the crisis during the design phase of construction projects?
3. How to manage the crisis in the design phase of construction projects?

The main research issues are as follows:

What causes the design process in construction projects to be compromised? These two divisions are made up of a total of 60 special partners.

This analysis was performed using Statistical Package for Social Science (SPSS) software. Variable statistics using SPSS software are distributed in the following table and chart.

1. Lack of Unit Management in Projects
2. The lack of coordination of the project team

Table 3

Lack of unit management in the project Lack of unit management in the project					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Low	1	4.3	4.3	4.3
	Medium	3	13.0	13.0	17.4
	Much	8	34.8	34.8	52.2
	Very much	11	47.8	47.8	100.0
	Total	23	100.0	100.0	

Table 4

The lack of coordination of the project team					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very low	1	4.3	4.3	4.3
	Low	4	17.4	17.4	21.7
	Medium	3	13.0	13.0	34.8
	Much	7	30.4	30.4	65.2
	Very much	8	34.8	34.8	100.0
	Total	23	100.0	100.0	

Table 5

Lack of Work Ethics (Managerial)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very low	2	8.7	8.7	8.7
	Low	7	30.4	30.4	39.1
	Medium	8	34.8	34.8	73.9
	Much	4	17.4	17.4	91.3
	Very much	2	8.7	8.7	100.0
	Total	23	100.0	100.0	

Table 6

Internal Competition (Competition Negative)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very low	2	8.7	8.7	8.7
	Low	5	21.7	21.7	30.4
	Medium	3	13.0	13.0	43.5
	Much	7	30.4	30.4	73.9
	Very much	6	26.1	26.1	100.0
	Total	23	100.0	100.0	

It is also considered for each factor of the table, which totals 24 tables, then check the validity of the questionnaire was using Cronbach's alpha coefficient.

$$\alpha = \frac{K}{K-1}\left(1 - \frac{\sum_i^k \sigma^2}{\sigma^2}\right)$$

In this formula (k) the number of questions, and (σ^2) is the variance of each question. The Cronbach's alpha coefficient is used to measure the one-dimensionality of attitudes, judgments, and other items that are not easy to measure.

Internal Reliability	Cronbach's alpha coefficient
Excellent	$\alpha \geq 0.9$
Good	$0.9 > \alpha \geq 0.8$
acceptable	$0.8 > \alpha \geq 0.7$
Questioned	$0.7 > \alpha \geq 0.6$
Poor	$0.6 > \alpha \geq 0.5$
unacceptable	$0.5 > \alpha$

Case Processing Summary			
		N	%
Cases	Valid	23	100.0
	Excluded[a]	0	.0
	Total	23	100.0
a. List wise deletion based on all variables in the procedure.			

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Lack of unit management in the project	81.00	223.545	.042	.904
The lack of coordination of the project team	81.52	201.625	.625	.893
Lack of cooperation from related departments or projects	82.09	198.901	.745	.890
Lack of work ethics (managerial)	82.39	204.613	.622	.893
Internal competition (competition Negative)	81.83	198.877	.652	.892
Lack of transformation management (inability to lead new ways in the project)	81.09	204.174	.654	.893
Appointing non-technical people in charge	81.04	212.771	.422	.898
The scheme imbalance in knowledge	81.96	210.316	.432	.898
Management weaknesses in not recognizing project strengths and weaknesses	81.26	201.929	.692	.892
Appointment of people with low knowledge level	81.65	206.874	.537	.895
Change and renewal of plan	82.04	199.862	.589	.894

Lack of planning and communication in the project	81.39	210.794	.515	.896
Lack of office facilities to carry out project work	82.13	211.846	.385	.899
Sophisticated design and detail (Details) inadequate about it	81.78	207.178	.573	.895
Delay in drawing and issuing drawings	81.57	216.075	.276	.901
Lack of risk management in projects	81.83	214.787	.241	.903
Conflict in project priorities	81.83	203.332	.678	.892
Poorly organized office project	81.61	204.704	.495	.896
Involvement in many projects at the same time	82.52	210.715	.316	.901
Vandalism, disruption and unforeseen side effects	81.74	208.747	.545	.895
Lack of attention to cultural issues and social norms in building design	82.13	206.573	.478	.897
Inadequate design and plan information for accurate estimation and planning	81.70	200.676	.661	.892
The lack of a specific timeline for the regular development of design	81.35	213.964	.339	.899
Poor control of the design flow and its development	81.57	216.530	.367	.899

II. Conclusion

Considering the statistics of the risk among the 24 risk identified by the researcher in the design phase of construction projects and distributed to questionnaires specialists in related fields, there are 6 types of high risk that are listed below:

- Lack of unit management in the project
- Lack of transformation management (inability to lead new talents in the project)
- Appointing non-technical people at the helm
- Management weaknesses in not recognizing project strengths and weaknesses
- Office of thick organization
- Organizing team's lack of coordination

Important Factors from the Interview:

- Lack of unified management and planning
- Lack of assessment of possible risks
- Lack of detailed study of lands and topography of the area
- Failure to examine religious, cultural and climatic conditions of the country
- Lack of economic planning in projects

Bibliography

1. Chapman and S. Ward New York, USA, 1997.
2. Geoges Dionne 21, oct, 2013.
3. Cooper and Coll, 2005.
4. Liy and Colleagues 20044.
5. Mahta Arjmand 13965.
6. Rafftery. E, and FN SPON, 1994.
7. L. Edward. 1995, London, UK.
8. Grimesy and M.K Lewis , 2002.
9. C.F Gray and W. Hughes. Osford, UK, 2001
10. Aaltonen, K., Kujala, J., Oijala, T., 2008. Stakeholder salience in...
11. Abednego, M.P., Ogunlana, S.O., 2006. Good project governance for proper...
12. Akintoye, A.S., MacLeod, M.J., 1997. Risk analysis and management in...
13. Al-Bahar, J., Crandall, K.C., 1990. Systematic risk management approach for
14. Aleshin, A., 2001. Risk management of international projects in Russia....
15. Baker, S, Ponniah, D., Smith, S., 1999. Risk Response Techniques...
16. Baloi, D., Price, A.D.F., 20 03. Modelling global risk factors...
17. Barber, R.B., 2005. Understanding internally generated risks in projects. International
18. Berkeley, D., Humphreys, P.C., Thomas, R.D., 1991. Project Risk Action...
19. Breysse, D., Elachachi, S.M., 2009. Risk and safety of temporary...
20. Hillson, D., Grimaldi, S., Rafele, C., 2006. Managing project...
21. Jaafari, A., 2001. Management of risks, uncertainties and opportunities...
22. Klemetti, A., 2006. Risk management in construction project networks....
23. Luu, V.T., Kim, S., Tuan, N.V., Ogunlana, S.O., 2009. Quantifying...
24. Mojtahedi, S.M.H., Mousavi, S.M., Makui, A., 2010. Project risk identification...
25. Pipa tanapiwong, J., 2004. Development of multi-party risk and uncertainty...
26. Perez, P.B., Gonzalez-Cruz, M.C., Pas tor-Ferrando, J.P., 2010. Analysis of...
27. Redmill, F, 2002. Risk analysis: A subjective process. Engineering Management...
28. Smith, N.J., Tony, M., Jobling, P., 2006. Managing risk in...

29. Tah, J.H.M., Carr, V., 2001. Towards a framework for project...
30. Zhi, H., 1995. Risk management for overseas construction projects.

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Finite Element Model for Prediction of Highway Pavement Deformation

By Arinze, Emmanuel Emeka, Agunwamba, Jonah Chukwuemeka
& Ezeokpube, Gregory Chukwuemeka
Michael Okpara University of Agriculture

Abstract- The determination of stresses developed in a pavement constitutes a basic prerequisite and is achieved mainly by implementation of various methods which is dependent on the number of distinct pavement layers. The need to predict the deformation of highway pavement with a precision that will aid optimal design cannot be oversized. Boussinesq's work was foundational for the development of all subsequent elasticity theories, but Boussinesq assumed one layer of uniform subgrade material. In this research, a mechanistic elastic model for obtaining deformation in road pavement was derived using Finite Element Method (FEM). This model was found to be an improvement on the Boussinesq model owing to the closeness of its result to that obtained from Plaxis software. In addition to this, it has the capability of handling deformation in both flexible and rigid pavement utilizing the dimensional similarities between unit weight and modulus of subgrade reaction of soil. A MATLAB program was also written for easy computation using the new model.

Keywords: pavement deformation; finite element model; boussinesq's model; MATLAB program.

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Finite Element Model for Prediction of Highway Pavement Deformation

Arinze, Emmanuel Emeka [α], Agunwamba, Jonah Chukwuemeka [σ] & Ezeokpube, Gregory Chukwuemeka [ρ]

Abstract- The determination of stresses developed in a pavement constitutes a basic prerequisite and is achieved mainly by implementation of various methods which is dependent on the number of distinct pavement layers. The need to predict the deformation of highway pavement with a precision that will aid optimal design cannot be oversized. Boussinesq's work was foundational for the development of all subsequent elasticity theories, but Boussinesq assumed one layer of uniform subgrade material. In this research, a mechanistic elastic model for obtaining deformation in road pavement was derived using Finite Element Method (FEM). This model was found to be an improvement on the Boussinesq model owing to the closeness of its result to that obtained from Plaxis software. In addition to this, it has the capability of handling deformation in both flexible and rigid pavement utilizing the dimensional similarities between unit weight and modulus of subgrade reaction of soil. A MATLAB program was also written for easy computation using the new model.

Keywords: pavement deformation; finite element model; boussinesq's model; MATLAB program.

I. Introduction

a) Causes of Pavement Deformation in Highway Pavement

Deformation of highway pavement can be occasioned by weak soils [1-2], frost action [3-4], expansive soils [5], Unbound aggregate material [6], seasonal drying and wetting [7]. Deformation can also result from thermal stresses [8], differential subgrade settlement [10], and aggregate morphology [11-12].

b) Methods of Analysis of Highway Pavement

Boussinesq's work was foundational for the development of all subsequent elasticity theories. Boussinesq's theory assumed one layer of uniform and homogenous subgrade material. According to [13], the stresses applied to an elastic homogenous and isotropic material extended to infinity at both directions, (horizontal and vertical) and the stress developed at any depth, z, below the surface of the pavement under the influence of a point load in Figure 1 can be calculated thus:

Vertical stress,

$$\sigma_z = \frac{3Q}{2\pi} \cdot \frac{Z^3}{R^5} \quad (1)$$

After the pioneering work of Boussinesq, different methods of analysis have been used in obtaining stresses and the accompanying deformation in highway pavement. Behera (2013) [14] used linear elastic theory in analyzing the deformation behaviour of fly ash composite material in the subbase of surface coal mine haul road. Uzan (2004) [15] applied the mechanistic framework in determining the permanent deformation of flexible pavement. Du and Dai (2006) [16] utilized the dynamic stability evaluation index in analyzing permanent deformation. It was discovered that the method is not fit for evaluating permanent deformation of asphalt mixture. Tchemou et al. 2011 [17] and Qiao et al. 2015 [18] applied rutting mechanisms in predicting flexible pavement degradation, [19] used model simulation in determining permanent deformation in high-modulus asphalt having sloped and horizontally curved alignment. Du and Shen (2005) [20] applied grey modelling method, [21] used field cores, and [22] used ground-penetrating-ladar in predicting the development of irrecoverable deformation in road pavement. Sawant (2009) [23] used dynamic analysis whereas [24] used the back-calculation of the transition probability approach. Each group of researchers demonstrated the merit of their method.

Many researchers have applied finite element method (FEM) in the analysis of deformation in highway pavement [25-28]. He et al. (2008) [29] used 3D visco-elastic finite element analysis (FEA) in determining asphalt pavement rutting deformation. Kim et. al. (2014) [30] used FEM in modelling the effect of environmental factors on rigid pavement deformation. In analyzing the influence of asphalt deformation under heterogeneous settlement of roadbed whereas [31] used elastic-plastic dynamic FEM to compute the differential settlement of the half-filled and half dug embankment under axle load. The latter succeeded in deriving a model for computing critical differential settlement. Each of the models is unique depending on the assumptions made by each group of researchers. Sadek and Shahrour (2007) [32] compared Boussinesq's model with the occasional plastic nature of subgrade and pavement materials. The researchers model was shown to be an improvement on Boussinesq's model.

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II. Purpose

This work involves the finite element method for predicting pavement deformation. Each model cited is derived either for rigid pavement and flexible pavement. However, this model is also unique owing to assumptions and approach was derived to handle both rigid and flexible pavement. Secondly, according to [33], many models used in the structural design of pavements are complex and/or difficult to use in the field, making its application in pavement analysis rather difficult. This model is devoid of such complexities.

III. Methodology

a) Derivation of the New Model

i. *Model Assumption*

In the derivation of the new model for deformation behaviour, the following assumptions were made;

1. Loading is symmetrical
2. Soil is elastic, homogenous and isotropic
3. The principle of superposition is valid
4. Constitutive law is valid
5. The idealized system of pavement structure is treated as a beam on elastic subgrade
6. The UDL from asphaltic concrete is converted to point load to produce the worst deformation needed for optimal design.
7. The problem is two-dimensional.

ii. *Model Derivation*

A road of base course thickness t_b, asphaltic concrete (AC) thickness as t_p, and width l is subjected to a standard axle load P_a as shown in Figure 10.

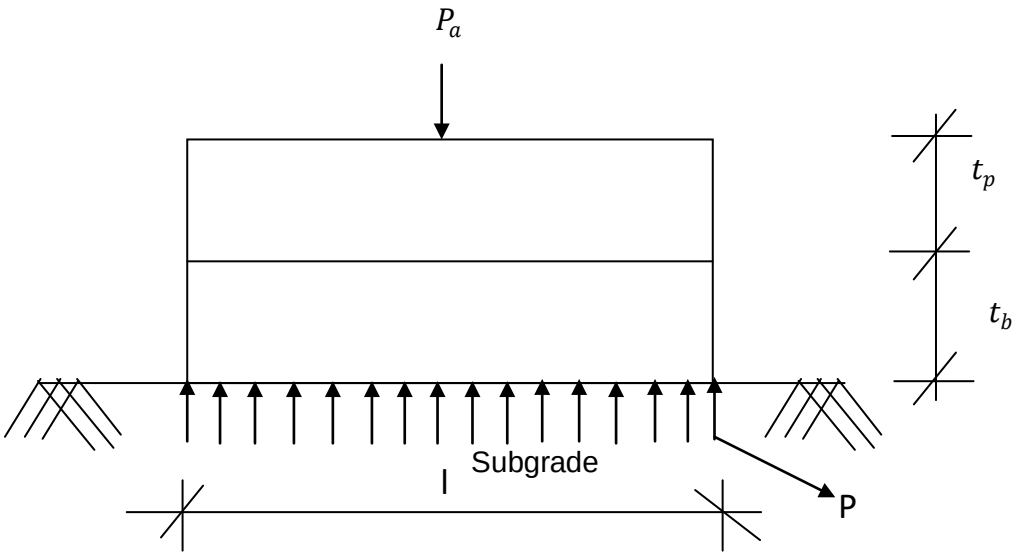

Figure 1: Simple model diagram

To convert the asphaltic concrete (AC) to a point load.

$$\text{Area of } AC = t_p \,.\, l \tag{2}$$

Let the modulus of subgrade reaction due to $AC = \text{ƙ}$

∴ Weight per unit length (UDL)

$$= l \,.\, t_p \,.\, \text{ƙ} \tag{3}$$

Converting the UDL to point load

$$P_u = (l\, t_p \kappa_{ac}) L = l^2 t_p \kappa \tag{4}$$

∴ Total point load on the pavement

$$P = Pa + l^2 t_b \kappa \tag{5}$$

The model diagram in Figure 1 is simplified in Figure 2.

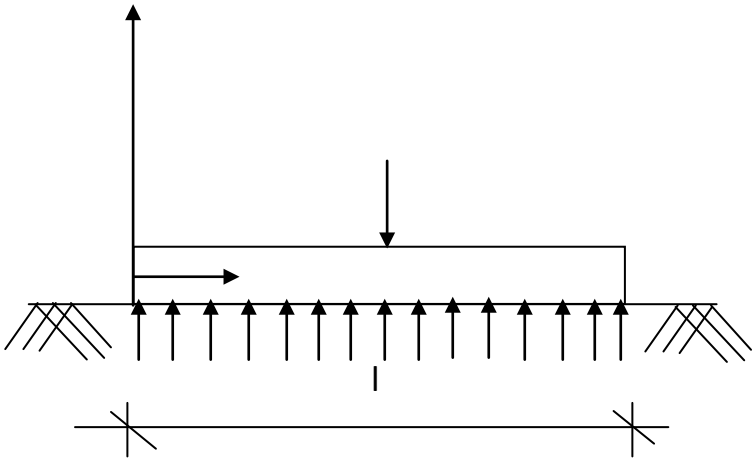

Figure 2: Model pavement with point load and moment

To determine the total stricture stiffness matrix for a spring assemblage by using the force/displacement matrix relation of FEM, the model is discretized into nodes and element as shown in Figure 3.

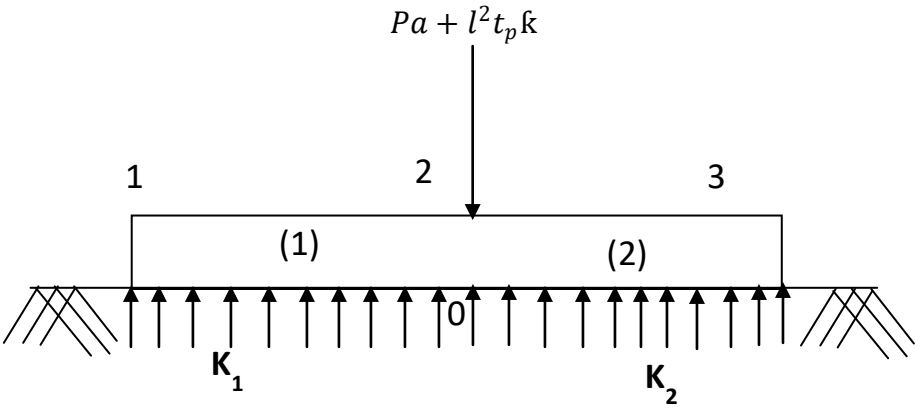

Figure 3: Pavement discretized into 2 elements and 3 nodes

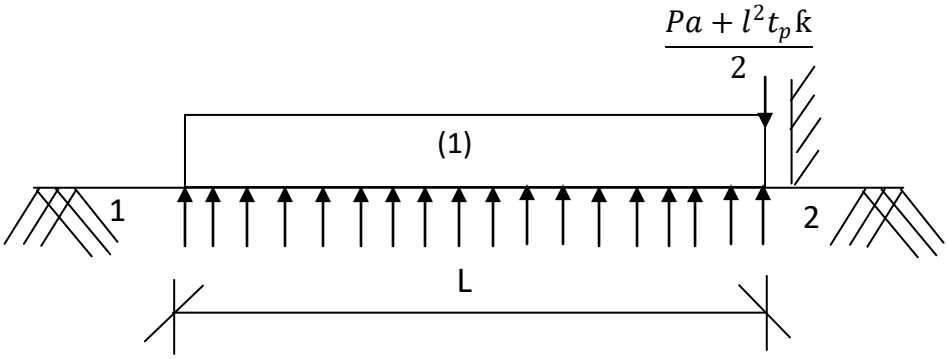

Figure 4: Symmetry of the discretized model pavement

Substituting into the Timoshenko beam element stiffness matrix, a global Equation (13) is obtained.

$$\frac{EI}{L^3(1+\emptyset_c)}\begin{bmatrix} 12 & 6L & -12 & 6L \\ 6L & (4+\emptyset_c)L^2 & -6L & (2-\emptyset_c)L^2 \\ -12 & -6L & 12 & -6L \\ 6L & (2-\emptyset)L^2 & -6L & (4+\emptyset_c)L^2 \end{bmatrix}\begin{Bmatrix} d_1 y \\ \emptyset_1 \\ d_2 y \\ \emptyset_2 = 0 \end{Bmatrix} = \begin{Bmatrix} F_1 y \\ 0 \\ \frac{Pa+l^2 tp\ k}{2} \\ 0 \end{Bmatrix} \quad (6)$$

Applying the boundary condition

$$d_1\, y = 0 = \emptyset_2$$

$therefore$ using the 2nd and 3rd row of equation 13 whose rows are associated with the two unknowns, $\emptyset_1$ and $d_2 y$ and simplifying, we obtain;

$$d_2 y = \frac{(Pa + L^2 t_P \mathfrak{k})(4 + \emptyset_c)L^3}{24EI} \quad (7)$$

For long slender beams with L about 10 times or more, the beam depth, shear correction term $\emptyset_c$ is small and can be neglected [34].

For standard highway, L=7.4 m, d = 0.6 m [35]

$$\therefore \frac{l}{d} = \frac{7.4}{0.6} \approx 12 \quad (8)$$

$$\Longrightarrow \emptyset_c = 0$$

If l= the whole length of the beam, then l = 2L and we can substitute $L = l/2$ in equation 5.38 to obtain the deformation in terms of the whole length of the beam as;

$$=> d_2 y = \left[\frac{\left(P_a + l^2 t_p \kappa\right) l^3}{48EI}\right] \quad (9)$$

IV. Conclusion and Recommendation

Many roads fail even before their design lives, probably because of using conservative models in their design to save cost. The cost implication of early maintenance and/or rehabilitation implies that using conservative models is not economical in the real sense. This new model, being close with the result from plaxis software shows that it is an improvement on Boussinesq's model which is found to be conservative. Secondly, the dimensional uniformity between unit weight and modulus of subgrade reaction was utilized by the researchers in making it a flexible model that can handle deformation in both rigid and flexible road pavement unlike many existing models.

V. Declarations

a) Ethical Approval and Consent to Participate

The research observed all ethical codes and done with the consent of all authors involved.

b) Consent for Publication

We give our Consent for the publication of the article.

c) Availability of Supporting Data

Not applicable

d) Code Availability

Not applicable

e) Funding

Not applicable

List of Abbreviations

σ_z = Vertical Stress
Q = Vertical Load
Z = Vertical Load
R = Influence Radius
t_b = Base Course Thickness
t_p = Asphaltic Concrete/ Rigid Concrete Thickness
l = Width of Pavement
$\mathfrak{k}$ = Modulus of Subgrade Reaction
P_a = Axle Load
d_2y = Deformation
$\emptyset$ = Shear Correction Factor
E = Young's Modulus of the Pavement
I = Moment of Inertia of the Pavement
d = Depth of the Pavement
e = Expected Values
o = Observed Values
V = Degree of Freedom
χ = Chi-square Value

Highlights

- The need to predict the deformation of highway pavement with a precision that will aid optimal design cannot be overemphasized.
- A mechanistic elastic model for obtaining deformation in road pavement was derived using Finite Element Method (FEM).
- The new model improved on Boussinesq's owing to the closeness of its result to that obtained from Plaxis software.
- The new model also has the capability of handling deformations in both flexible and rigid pavement.

References Références Referencias

1. Jegede G. (2004). Highway pavement failure induced by poor soil geotechnical properties along the F209 Okitipupa-Igbokoda highway, South Western Nigeria. Ife Journal of Science, 6(1)-41-44. doi: 10.4314/ijs.v6i1.32121.
2. Jiang X, and Qiu Y.T. (2004) The influence of asphalt pavement deformation due to the differential subgrade settlement. Hydrogeology and Engineering Geology, 04. http://en.cnki.com.cn/Journal_en/A-A011-SWDG-2006-04.htm
3. Wen Z, Sheng W, Ma W, Wu Q.B and Fang J.H. (2009). Ground temperature and deformation laws of highway embankments in degenerative permafrost regions. Chinese Journal of Rock Mechanics and Engineering, 07 http://en.cnki.com.cn/Article_en/CJFDTotal-YSLX200907024.htm
4. Peng H, Ma W, Mu Y, Jin L, (2015). Impact of permafrost degradation on embankment deformation of Qinghai-Tibet Highway in permafrost region. Journal of Central South University, 22,1079-1086. https://link.springer.com/article/10.1007/s11771-015-2619-2.

5. Hossain S. Ahmed S, Khan M.S, and Aramoon A. (2016). Expansive subgrade behavior on a state highway in North Texas. Geotechnical and Structure Congress, Phoenix Arizona https://ascelibrary.org/doi/abs/10.1061/9780784479742.099
6. Tutumular E. and Pan T. (2008). Aggregate morphology affecting strength and permanent deformation behavior of unbound aggregate materials. Journal of Materials in Civil Engineering, 20(9) https://doi.org/10.1061/(ASCE)0899-1561(2008)20:9(617).
7. Wang G, Wang Y, Thompson R and Ahn, Y H. (2012). Long-life pavement design and construction-a case study. The 9th Asia Pasific Transportation Development Conference, 574-582.
8. Tutumular E. and Pan T. (2008). Aggregate morphology affecting strength and permanent deformation behavior of unbound aggregate materials. Journal of Materials in Civil Engineering, 20(9) https://doi.org/10.1061/(ASCE)0899-1561(2008)20:9(617).
9. Jiang X, and Qiu Y.T. (2004). The influence of asphalt pavement deformation due to the differential subgrade settlement. Hydrogeology and Engineering Geology,04 http://en.cnki.com.cn/Journal_en/A-A011-SWDG-2006-04.htm
10. Ling, T., Nor, H., Hainin, M. and Chik, A. (2009). Laboratory performance of crumb rubber concrete block pavement. International Journal of Pavement Engineering, 10(5), 361-374 https://doi.org/10.1080/10298430802342740.
11. Pan T, Tutumuluer E, Carepenter S.H. (2006). Effects of coarse aggregate morphology on permanent deformation behavior of hot mix asphalt. Journal of Transportation Engineering. 132(7), https://doi.org/10.1061/(ASCE)0733-947X(2006)132:7(580).
12. Kanitpong, K., Charoentham, N. and Likitlersuang, S. (2012). Investigation on the effects of gradation and aggregate type to moisture damage of warm mix asphalt modified with sasobit. International Journal of Pavement Engineering, 144(1),13-24 https://doi.org/10.1080/10298436.2011.565058
13. Kanitpong, K., Charoentham, N. and Likitlersuang, S. (2012). Investigation on the effects of gradation and aggregate type to moisture damage of warm mix asphalt modified with sasobit. International Journal of Pavement Engineering, 144(1),13-24 https://doi.org/10.1080/10298436.2011.565058
14. Behera, B.(2013) Experimental and numerical investigation into behavior of fly ash composite material in the Subbase of surface coal mine haul road. Ph.D Thesis, National Institute of Technology India.https://pdfs.semanticscholar.org/3e02/eb9d007c10cc126e981b86eeb5214e0e2417.pdf
15. Uzan J. (2004). Permanent deformation in flexible pavements. Journal of Transportation Engineering 130(1) https://doi.org/10.1061/(ASCE)0733-947X(2004)130:1(6).
16. Du S. and Dai J. (2006). Permanent deformation evaluation index of asphalt mixture. China Journal of Highway and Transport, 19(5),18-22. http://en.cnki.com.cn/Article_en/CJFDTotal-ZGGL200605004.htm
17. Tchemou G, Minsili L.S, Mototemapa A.M, Eko R.M and Manguelle J.H. (2011). Prediction of flexible pavement degradation: application to rutting in Cameroonian highway, Electronic Journal of Geotechnical Engineering 16 (o),1301-1319 https://pdfs.semanticscholar.org/ba5c/2464c5782149d2864af8c5ac9f6261f172ea.pdf
18. Qiao, Y., Dawson, A. Huvstig, A and Korkiala-Tunttu, L. (2015). Calculating rutting of some thin flexible pavements from repeated load triaxial test data. International Journal of Pavement Engineering, 16(6):467-476 https://doi.org/10.1080/10298436.2014.943127
19. Zheng M, Han L, Wang C, Xu Z, Li H. and Ma Q. (2017). Simulation of permanent deformation in high-modulus asphalt pavement with sloped and horizontally curved alignment. Applied Sciences 131(1),4-8 https://doi.org/10.3390/app7040331
20. Du J.C. and Shen D. (2005). Development of pavement permanent deformation model by grey modelling method. Civil Engineering and Environmental System 2005; 22(2),109-121doi:10.1080/10286600500126348.
21. Li Q, Yang H, Ni F, Ma X, and Luo L. (2015). Cause analysis on permanent deformation for asphalt pavement using field core. Construction and Building Material, 100(1), 40-51 (2015). https://doi.org/10.1016/j.conbuildmat.2015.09.012
22. Tosti F, Ciampoli L.B, D'Amico F, Alani A.M. and Benedetto A. (2018). An experimental-based model for the mechanical properties of rod pavements using ground-penetrating radar. Construction and Building Material, 165(20):966-974 https://doi.org/10.1016/j.conbuildmat.2018.01.179.
23. Sawant, V. (2009). Dynamic analysis of rigid pavement with vehicle pavement interaction. International Journal of Pavement Engineering, 10(1):63-72https://doi.org/10.1080/10298430802342716.
24. Abaza, K. (2016). Back-calculation of transition probabilities for Markovian-based pavement performance prediction model. International Journal of Pavement Engineering, 17(3),253-264 https://doi.org/10.1080/10298436.2014.993185.
25. Helway S., Dyer J. and Leidy, J. (1998) Finite element analyses of flexible pavement. Journal of Transportation Engineering https://ascelibrary.org/doi/abs/10.1061/(ASCE)0733-947X(1998)124:5(491)

26. Rahman, M. and Erlingsson, S. (2015). Predicting permanent deformation behavior of unbound granular materials. International Journal of Pavement Engineering, 16(7):587-601 https://doi.org/10.1080/10298436.2014.943209
27. Collop, A., McDowell, G. and Lee, Y. (2004). Use of the distinct element method to model the deformation behavior of an idealized asphalt, International Journal of Pavement Engineering, 5(1), 1-7. https://doi.org/10.1080/10298430410001709164.
28. Nahi M.N, Ismail A. and Ariffin A.K. (2011). Analysis of asphalt pavement under non-uniform tire pavement contact stress using finite element method. Journal Applied Sciences 11(1),2562-2569 doi: 10.3923/jas.2011.2562.2569
29. He Z, Lei T, Chen H, Wang G. and Hou, Y. A. (2008). 3D visco-elasto-plastic finite element analysis of the asphalt pavement rutting deformation. Journal of Chogqing Jianzhu University, 06 http://en.cnki.com.cn/Article_en/CJFDTotal-JIAN200806006.htm
30. Kim S, Ceylan H, Gopalakrishnan K. (2014). Finite element modeling of environmental effects on rigid pavement deformation. Frontiers of Structure and Civil Engineering 8,101-114 https://link.springer.com/article/10.1007/s11709-014-0254-x.
31. Weng W, Zhang X, Chen B, Yan S. (2004). Nonlinear FEM analysis of influence of asphalt pavement under non-homogenous settlement of roadbed. China Journal of Highway and transport; 01 http://en.cnki.com.cn/Article_en/CJFDTotal-ZGGL200401003.htm
32. Sadek M, Shahrour I. (2017). Use of Boussinesq's solution in geotechnical and road engineering: Influences on plasticity. Comptes Rendus Mecanique, 335(9-10), 516-520. DOI: 10.1016/j.crme.2007.08.007
33. Leiva-Villacorta, F., Vargas-Nordcbeck, A. and Agular-Moya, J. (2017). Permanent deformation and deflection relationship from pavement condition assessment. International Journal of Pavement Research and Technology, 10(4), 352-359. https://doi.org/10.1016/j.ijprt.2017.03.005
34. Logan, D.L. (2012). First Course in the finite element method. Cengage Learning. ISBN-13: 978-0495668251.
35. Garg S.K. (2013). Soil mechanics and foundation engineering. Khanna Publishers, New Delhi. *ISBN* 9788174091048.

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A Synergic Approach of Dredging Disposal and Extraction of Sand with Reference to Hugli Estuary

By B. Chaudhuri, Bal Krishna, R. P. Dubey, Ambarish Ghosh & S. N. Das

Abstract- The channel leading to the Haldia Dock Complex (HDC) create unpredicted flow field resulting nonlinear sediment transport over critical stretches during different season. Thus, the irregular sediment transport siltation and fall in navigable depth in the shipping channel remained permanent cause of worry. Therefore, maintenance dredging by Trailer Suction Hopper Dredgers (TSHD) is necessary. In the context of dredging-disposal scenario, an innovative synergic dredging disposal treatment plan has been conceptualized to reuse the dredged material by extracting sand through the plants installed on barges and thereafter transport it through waiting barges. This paper deals with the methodology involved in the entire chain of events: dredging by THSD disposal through barges-transport to installed sand washing plants over another big barge-extraction of sand-transfer to waiting barges-supply for industrial use in geotechnical engineering that justifies reuse of materials giving boost to other industry and increases.

Keywords: *auckland bar, dredging disposal, haldia dock complex, hugli estuary, TSHD.*

GJRE-E Classification: *FOR Code: 290899*

Strictly as per the compliance and regulations of:

A Synergic Approach of Dredging Disposal and Extraction of Sand with Reference to Hugli Estuary

B. Chaudhuri [α], Bal Krishna [σ], R. P. Dubey [ρ], Ambarish Ghosh [ω] & S. N. Das [¥]

Abstract- The channel leading to the Haldia Dock Complex (HDC) create unpredicted flow field resulting nonlinear sediment transport over critical stretches during different season. Thus, the irregular sediment transport siltation and fall in navigable depth in the shipping channel remained permanent cause of worry. Therefore, maintenance dredging by Trailer Suction Hopper Dredgers (TSHD) is necessary. In the context of dredging-disposal scenario, an innovative synergic dredging disposal treatment plan has been conceptualized to reuse the dredged material by extracting sand through the plants installed on barges and thereafter transport it through waiting barges. This paper deals with the methodology involved in the entire chain of events: dredging by THSD disposal through barges-transport to installed sand washing plants over another big barge-extraction of sand-transfer to waiting barges-supply for industrial use in geotechnical engineering that justifies reuse of materials giving boost to other industry and increases. The entire operation will be on the barge and this will be unique innovative concept applicable for Hugli estuary where the mode of shore disposal could not be taken up due to paucity of land and other occupational hazard. This will also serve the purpose of shore disposal cum silt trap dredging aimed to reduce siltation and recirculation yielding decrease in annual dredging quantity in long run.

Keywords: auckland bar, dredging disposal, haldia dock complex, hugli estuary, TSHD.

I. Introduction

Maintenance Dredging is essential for Kolkata Port for safe and smooth navigation [1] to its dock systems. Dredged material arising out of such dredging activity has been suitably disposed of as open river disposal at deep pockets depending upon the proximity of dredging location as well as availability of land for onshore disposal [2]. Over the decades Kolkata Port Trust (KoPT) is planning to undertake a project of Silt Trap Dredging at Haldi river confluence near one of its dock system i.e Haldia Dock Complex (HDC) at Haldia [3]. The Index Plan of Hugli Estuary showing Navigation channel encompassing two Dock Systems i.e. Khidirpur Dock System (KDS) and HDC of KoPT is referred at Fig.1. The entire dredged material of the Silt Trap Dredging project is proposed to be disposed at shore [4].

In order to keep a comfort level of depth in the shipping channel, maintenance dredging by Trailer Suction Hopper Dredgers (TSHD) is carried out every day throughout the year [5]. The approximate annual dredging volume is 10 Mm^3. The dredged material is disposed in open river i.e., in the estuary at deeper locations, situated at the entrance of Bay of Bengal. Thus, the dredgers need to travel quite a significant distance for dumping and lose substantial amount of dredging time resulting longer dredging cycle time as well as yielding low efficiency [6] in putting the dredged material in the river for its re-circulation. Sometimes, side castings, over flow methods are also adopted. The shore disposal of dredged materials have been tried in very few occasions, those, compared to the total annual volume, remained to be very insignificant. The main reasons of non-implementation of shore disposal may be attributed to the following points:

- Non-availability of adequate land near the dredging locations and
- Inability by the dredging contractor to undertake the shore disposal.

In the context of above dredging-disposal scenario, an innovative synergic dredging, disposal and treatment plan has been conceptualized, during on-going Maintenance Dredging, which will not only substitute Silt Trap Dredging but also permit the Authority an opportunity to re-use the dredged material by extracting sand through the plants installed on barges and there after transport it through waiting barges for its commercial use to Industry.

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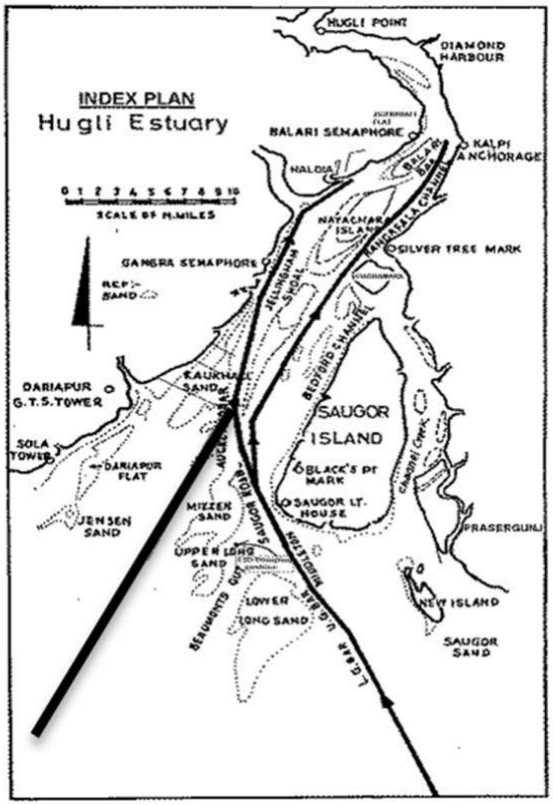

Figure 1: Index Plan of Hugli Estuary showing Navigation channel

This paper deals the methodology involved in each step of the entire chain of events i.e., dredging by THSD disposal through barges-transport of dredged materials to installed sand washing plants accommodated over another big barge-extraction of sand-transfer to waiting barges-supply for industrial use in geotechnical engineering. The methodology, apart from justifying the reuse of dredged materials, giving boost to other industry, increases the efficiency of dredging by removing the material entirely from the system, reducing recirculation, enhancing the probability of decreasing annual dredging volume.

II. Geo-Hydromorphology of Hugli Estuary

a) Tides

The tide, current and salinity measurements were made at the western fringe of the Sagar Island close to the Auckland Bar, one of the prime dredging stretches over the Navigational Channel leading to Haldia Dock Complex (HDC). While formulating Shore disposal scheme. It is proposed to dredge the river bed material from the Auckland Bar and dispose of along the western coast of Sagar Island within Dykes. Tide levels of three tide gauges viz., Sagar, Gangra and Haldia, relevant to the study area are given in Table 1. Tides of Hooghly estuary at Auckland Bar near Sagar Island during pre-monsoon season are shown in Fig 2, whereas those during monsoon season are shown in Fig 3. The spring tidal range is 4.0 m with 5.0 m as high water and 1.0 m as Low water. Neap tidal range is 2.0 m with 4.0 m as high water and 2.0 m as low water. The Mean Sea Level (MSL is stated to be 2.82 m in this area. Tides are recorded at Sagar tidal station and are used for prediction of tides at Sagar Island. The predicted tides as usually available in published Tide tables by Survey of India, have also been analyzed to understand the overall tidal behaviour in a year. The analysis was carried for flood and ebb ranges as well for low and high waters [7]. It is understood that approx. 43% of time the range is less than 3 m while 57% of time the tidal range is more than 3 m. The analysis of low and high waters is also carried out. It can be seen that 100% of time high water is higher than 3 m while 82.5% of time low water is more than 1 m.

Table 1: Tide levels of at Sagar, Gangra and Haldia

Tide Gauge	Lat (N)	Long (E)	Height in meter above datum				
			MHWS	MHWN	MLWN	MLWS	MSL
Sagar	21039'	88003'	5.2	3.9	2.2	0.9	3.0
Gangra	21057'	88001'	5.6	4.1	2.1	0.8	3.2
Haldia	22002'	88006'	5.7	4.3	2.1	0.8	3.2

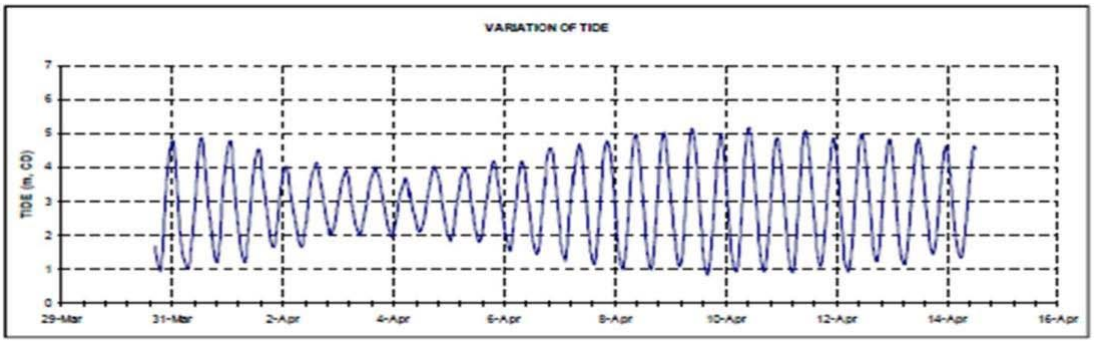

Figure 2: Tides in Hooghly estuary at Auckland Bar near Sagar Island during pre-monsoon season

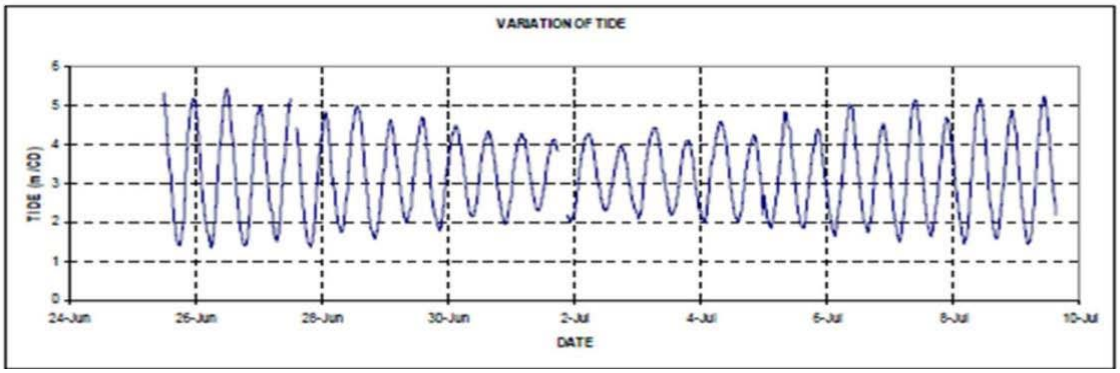

Figure 3: Tides in Hooghly estuary at Auckland Bar near Sagar Island during monsoon season

b) Currents

The typical time series plot of the current speed and direction observation for 15 days during monsoon season at Auckland Bar near Sagar Island are presented in Fig 4 and Fig 5. The variation of currents at various level can easily be observed from the figure.

c) Wind and Wave

Surface waves in the coastal zone of West Bengal are mainly due to wind. Sea waves in this region rarely become destructive except during cyclonic storm. A one year typical wind rose diagram is shown in Fig 6. During South West Monsoon the wind speed rises above 100 km/hr and is usually accompanied by spring tides. When cyclonic incidences coincide with spring tides, wave height can rise over 5.0 m. Ripple waves also appear in the month of October, November and December when wind generated wave height varies approximately from 0.2 m to 0.35m. In the months of April to August, comparatively larger waves form in the shelf region and they start breaking, when they approach coastal margins. During this period wave height raises to 2 m, which causes maximum scouring on land masses. Wave action, micro and macro tidal cycles and long shore currents are recorded in most of Islands in this ecosystem. During cyclone, the water depth over tidal flats exceeds 7.0 m which will allow 5.0 m waves to touch the Sagar Island.

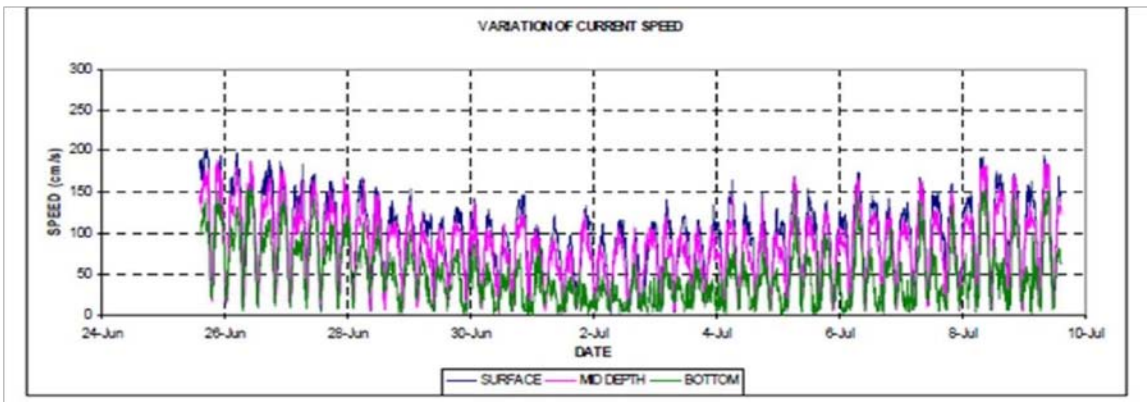

Figure 4: Time series plot of current speed during Monsoon Season

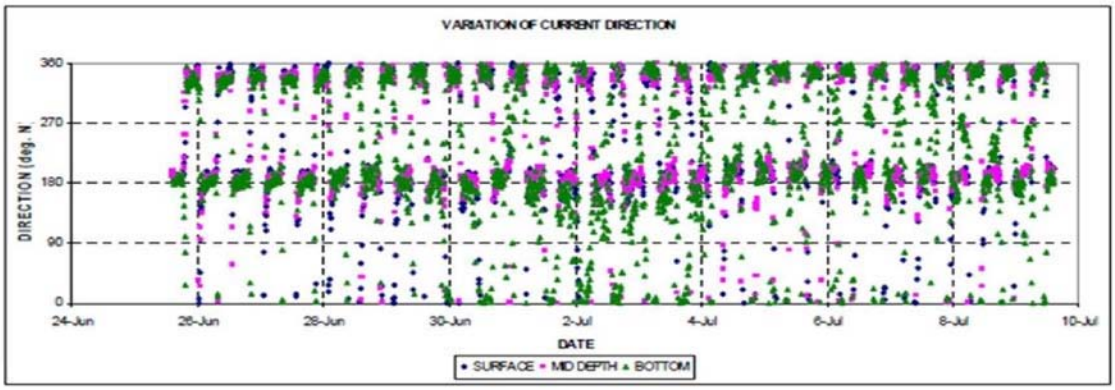

Figure 5: Time series plot of current direction during Monsoon Season

d) Grain Size of Dredged Material

The material dredged during Maintenance Dredging in the Hugli estuary, has been tested and found that natural river bed sediment is constituted of mainly fine sand mixed with less quantity of silt and clay. Sieve analysis of Bed Soil samples, collected over Jellinghum and Auckland Bar are shown in Fig 7. Such materials can be treated as well washed in sand extraction plant and be beneficially used in the Construction and other Industries.

e) Chemical Properties of the Dredged Material

The Sample analysis of chemical properties of the Dredge materials collected from Jellinghum and Auckland areas are presented in Table 2.

III. Dredging and Dumping Location

Maintenance dredging by Trailer Suction Hopper Dredgers (THSD) is carried out every day throughout the year over the critical stretches of Navigational Channel (known as Governing Bars) to keep a comfort level of depth in the shipping channel [8]. Of late the maintenance dredging is carried out over three areas namely, Jelligham, Haldia Anchorage and Eden Channel. Since, Maintenance Dredging commenced in Eden Channel, after it's opening, by-passing Auckland Channel (severely siltation prone area), the use vis-à-vis, maintenance dredging over the Auckland area was stopped. The annual dredging volume thus became 10-11 Mm^3 reducing from 14-15 Mm^3. Silt Trap Dredging was planned near a location close to Jellingham and Haldia Anchorage, so that the effect of this dredging gets imparted to both the prime dredging locations and in turn, those area remain healthy and their dredging requirements get reduced in the long run. The area, thus planned for Silt Trap Dredging was the confluence of Haldia River with Hugli River, commonly known as Haldia River confluence. The Silt Trap Dredging was planned for execution for at least 2-3 years in continuum in conjunction with annual maintenance dredging. Again, this was required to be undertaken through a separate dredging contract requiring deployment of Cutter Suction Dredger and disposal of dredged materials on shore through a combination of floating and shore pipe lines, requiring substantial additional resources and cost, apart from operational and environmental hazards. The daily dredging volume, taken together from Jellingham and Haldia Anchorage, located around 12-14 km. and 5-6 km. respectively from Haldia dock usually remained around 7-8 loads, whereas in Eden area (located around 40-45 km. from HDC), 3-4 dredge loads are taken every day. Hence, the total annual maintenance dredging volume over Jelligham and Haldia Anchorage stands around 6-7 Mm^3 whereas the same over Eden area is required around 3-3.5 Mm^3 for maintaining comfort level of Navigable depths over the Governing Bars facilitating safe navigation [9]. The dredged material is disposed of in open-river in the estuary at deeper locations at the entrance of Bay of Bengal by the THSDs through opening of hopper doors [10].

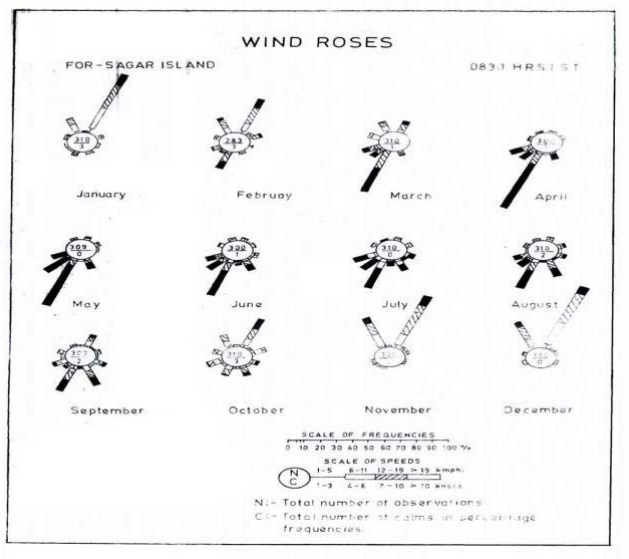

Figure 6: Typical Wind Rose Diagram

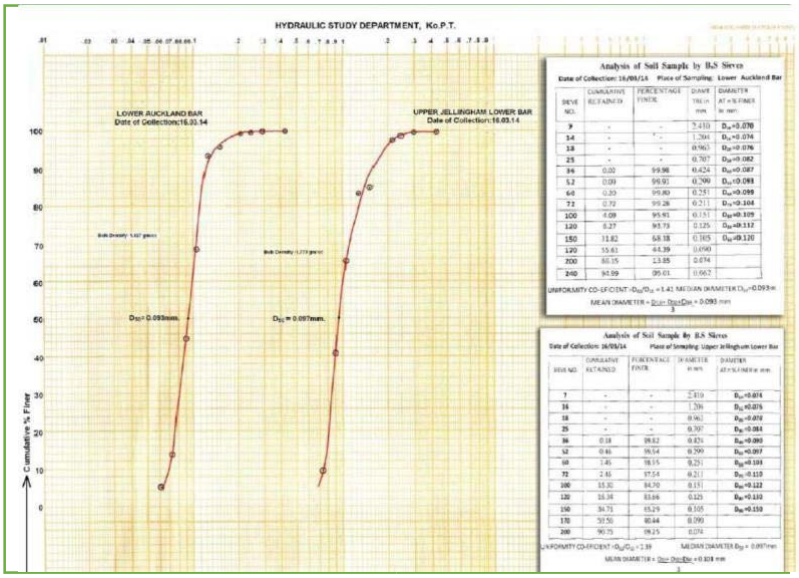

Figure 7: Sieve analysis of bed soil sample collected over Jellinghum and Auckland Bar

IV. Problem

Due to the long distance of the dumping ground, the dredgers have to spend idle time in travelling only. Dredger is not able to dredge to attend the critical stretches where depths remained minimum for most of the days in a month. The available tidal window and the required draft of the dredger also plays critical role in deciding the dredging time. Hence, the contact time of dredger i.e. the actual dredging period gets reduced due to long travel time of the dredger for travelling from dredging spot to the dumping ground and back. Hence, the shore disposal has been thought of so that entire material gets out of the system without losing any more time than the prevailing dredging cycle. The prevailing dredging cycle for open-river dumping is nearly 4 to 5 hrs ((for dredgers dredging over Jelligham and Haldia Anchorage). The silt trap dredging, equipped with one of the disposals of the material in shore, is thus conceptualized, which will have following activities:

- Identification of the location: by mathematical modelling where a cutter section dredger will be deployed. The floating pipe line of around 500 m length , attached with another 700m shore pipe line will take the dredged material out of system and put in a Confined Detention Area (CDA) comprising compartments and sluices so that water will come out and dredged material can settle over the compartments.

Transportation of the settled material from compartments to other Industrial spots (directly, if gets reasonably dried, which of course, will be disrupted during monsoon , thus adversely affecting yield of Silt Trap Dredging time or even causing stoppage) and/or use of this dredged material for sand extraction.

Table 2: Chemical properties of the dredge materials

No	Sample No. 1 Auckland	Sample No. 2 Auckland	Sample No. 3 Auckland	Sample No. 4 Auckland	Sample No. 5 Jellinghum
Al_2O_3(%)	17.87	15.68	15.91	17.90	21.87
Fe_2O_3(%)	5.90	4.80	5.00	6.20	8.70
MgO(%)	1.20	1.12	1.20	1.50	1.90
CaO(%)	1.65	1.30	2.17	1.96	2.10
MnO(%)	0.11	0.07	0.05	0.05	0.06
Na_2O(%)	1.30	1.25	1.20	1.40	1.30
K_2O (%)	2.10	2.57	2.28	2.14	1.80
TiO_2 (%)	0.38	0.47	0.35	0.36	0.44
P_2O5(%)	.14	.16	.09	.09	.11
Cu (ppm)	10	15	10	15	20
Pb (ppm)	20	15	15	20	30
Zn (ppm)	120	100	80	110	120
Ni (ppm)	15	20	15	15	15
Co (ppm)	15	10	15	15	25
Cd (ppm)	<5	<5	<5	<5	<5
Ba (ppm)	460	430	400	410	490
Sr (ppm)	5	10	10	15	20
Cr (ppm)	25	30	15	20	50
V (ppm)	60	50	40	50	45
Mo (ppm)	10	10	15	10	20

This entire method as explained above will require deployment of additional cutter section dredger, floating as well shore pipeline and/or setting of sand extraction plant over land for further transportation of the extracted sand. This will be a continuous process and require sufficient land for the stacking and its disposal. This scheme will require two separate contracts also which will have following constraints:

i. Maintenance of an additional dredger i.e. cutter section dredger and floating as well shore pipeline apart from dredgers (THSDs) deployed for maintenance dredging.

ii. Maintenance of the silt trap and sand washing plant.

The Fig 8 and Fig 9 show the sand extraction plant and processed sand ready for use. Due to paucity of land, significant number of trucks/dumpers will have to move through residential area which will pose a significant concern of Environmental pollution. The above activities will thus create a very complex chain of events and any shortfall or disruption of activities in this chain will make the entire package vulnerable even ending up in failure.

Figure 8: Sand extraction Plant

Figure 9: Processed sand ready for use

So, this scheme (Silt Trap Dredging) has not been encouraged and didn't get much response. Rather, the explorations of other alternatives were continued. Finally, an innovative synergic dredging cum disposal technology has been conceptualized through ongoing annual maintenance dredging contract, yielding the result of Shore disposal.

V. Approach

Entire dredging cum disposal operation will be on water. Assembled barge, dredger, pump and sand extraction plant will be utilized to wash the sand, which may be used for industrial purpose. This will be pollution free, cheap, user friendly, eco-friendly and hazardless. The scheme has been planned for operationalization in two ways:

Option 1: Combination of THSD, berthing pontoon, settling barge, feeder barge, plant barge, washing plant, transport barge.

Option 2: Combination of THSD, cutter suction dredger, spider barge, feeder barge, extraction plant and product cum transport barge.

Under Option 1 following activities shall follow:

- Jellingham and Eden Load taken by TSHD in hopper.
- Transferred and pumped by pipeline via berthing pontoon into a settling tank accommodating in an assembled barge.
- Settled material from storage tank transferred to the feeder barge.
- Feeder barge moved to assembled barge accommodating the plant.
- Settled solid transferred from the feeder barge to main sand washing plant.
- Sand washed, extracted and transferred to transport barge.
- Transport barge sailed to destination.

Under Option 2 following activities shall follow:

- Jellingham and Eden load dumped at deep locations.
- Lifting of dumped spoil by slurry pumps from spider barge.
- Maintenance of the deep gutter by cutter suction dredger.
- Spider barge transferring the material to feeder barge.
- Feeder barge moves to washing plant accommodating barge.
- Processing online by sand washing plant.
- Transferring sand to product barge.
- Releasing washed silt into river.
- Sailing to destination by product barge.

The schematic diagram of dredging cum disposal operational procedures and a typical view of Site Operation are shown in Figs.10 and 11 respectively.

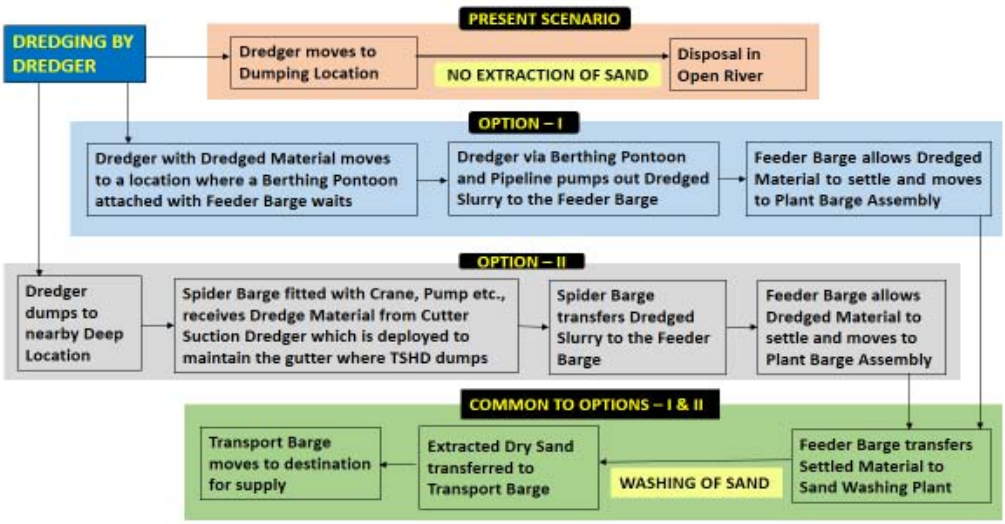

Figure 10: Schematic diagram of dredging cum disposal operational procedures

Figure 11: Typical view of Site Operation

The entire operation will be on the barges and this will be unique innovative concept applicable for Hugli Estuary where the mode of shore disposal could not be taken up due to paucity of land and other occupational hazard.

VI. Benefits

Environmental benefits:

- 100% removal of sediment from the system.
- Reduce the recirculation as well as re-siltation resulting less requirement of maintenance dredging in the long run.
- Reduce per unit cost of the dredging.
- No land acquisition.
- Synergy of different engineering approaches.
- Green field activities generating useful sand for engineering works.

Anticipated benefits:

- No land area is required for plant & dredge material disposal.
- Commencement of long awaited synergy green field actions.
- Reuse of dredged material.
- Reduction of annual dredging volume vis-a-vis cost in the long run say after 5 years.
- Operationalization of the process at a lesser cost than the proposed shore disposal.
- Maintenance of only one contract without disrupting on-going maintenance dredging vis-à-vis contract.

VII. Discussion and Inferences

It is evident from above options that Option 1 is best one and this will be economical, eco-friendly and user friendly also. This will not require developing and/ or deployment of any special dredger i.e. cutter suction dredger and its continuous removal of slurry from deeper gutter. In case of Option 2, the material is dumped in deeper gutter which will have some dispersion effect in its vicinity. This location has to be pre-identified for its safe operationalization towards uninterrupted supply of bed material and sustenance of depth of the deep gutter.

The Option 1 in other hand is not at all interfering with maintenance dredging schedule and the dredgers utilized during maintenance dredging operations, could be applied for pumping the dredged material in to the sand extraction plant holding barge (via feeder barge), which entirely wash the sand and transfer it to transport barge for ultimately, feeding the construction industry.

The physical property of the material is as followed:

- Bulk density of dredged material is 1.65 gms/cc
- Specific Gravity is 2.65

At least one load from Jellingham could be utilized for sand extraction; the total yield can be estimated as:

- Volume of one hoper load of TSHD is approx. 4500 m^3.
- Settled solid will be of the order of 1800 m^3.
- Extracted sand would be of at least 75% i.e. 1350 m^3.
- Expected operation days are 300 per year. So, the total sand extraction will be of the order of 0.4 Mm^3.

Assuming Rs 500/- per cubic meter as the selling price of dry washed sand, the expected annual revenue generation would be of the order of Rs. 20 Cr by this effort of installing a moderate size plant having capacity around 150 ton/hour. Ultimately in the long run, this environment friendly, synergic green effort will lead to decrease the annual volume of maintenance dredging, since the entire dredged volume, transferred for washing, is removed from system.

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References Références Referencias

1. Kray, C. J.: Super ship effect on waterway depth and alignments. Journal of the Waterways and Harbours Division ASCE, 96, No. WW2 paper 7305 (1970).
2. Chaudhury, B., Rout, B., Das, M. K.: Dredging and its response in Hooghly River and Estuary. Dredging Seminar, DCI (2005).
3. McManaus and Irving R.: Reclamation Dredging and Instrumentation, Proc. Symposium on Dredging, London Institution of Civil Engineers, London (1976).
4. Shariff, S.: Cost benefit in dredging projects, expertise in laying and maintenance of discharge pipelines. Dredging Seminar, DCI of India (2005).
5. Ridder Van de and Dewitt.: The effective development of trailing suction hopper dredgers in the port of Rotterdam. Maintenance dredging. Proc. of conference organized by ICE London at Bristol, Thomas Talford (1987).
6. Chaudhuri, B., Ghosh, A., Yadav, B.K., Dubey, R.P., Samadder, P., Ghosh, Arijit ., Das, A., Majumder, S., Bhandari, S., Singh, N., Das, S.N.: Evaluation of Dredging Efficiency Indices of TSHDs deployed in a Navigational Channel leading to Haldia Dock Complex. ISH Journal of Hydraulic Engineering. DOI: 10.1080/09715010.2020.1786738, Published online (2020).
7. Ghosh, S. N.: Tidal Hydraulic Engineering, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi (1997).
8. Ghosh, S. N., Chowdhury, B.: Dredging technology in Riverine and Coastal Areas, Abc Publications, Kolkata, India (2016).
9. Yadav, B. K., Dubey, R. P., Chaudhuri, B., Bhaskaran, P. K.: Methodology for reclamation of Nayachara Island by dredging material from Jellingham Shoal of Hooghly Estuary by DCI TSHD. 22nd International Conference HYDRO-2017, L D College of Engineering, Ahmedabad, (2017).
10. Chaudhuri, B., Mahapatra, R.: Geotechnical information and its influence on hopper volume measurement with special reference to Hooghly Estuary, Dredging Seminar, DCI (2005).

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Neutron Concentrator, a Hypothetical Small Neutron "Star" based on the Emission of Neutrons in Minerals such as Granite and Other Commonly Available Objects

By Francesco Pia

Abstract- The aim of this work is to verify the existence of neutron emission in some "circuits" mainly composed of common stones.

The idea of this work finds its foundation in the moment in which it is possible to limit the scattering of any neutrons produced, once this is done, the neutron beam could be driven so that they are concentrated in a certain point.

The generation of neutrons should obviously be channelled taking into consideration the scattering that is obtained in the minerals that make up these devices after they have been emitted and if a way to contain (a confined space) with an "adjustable" scattering could be found then it could be that the idea of generating a small neutron star could be a viable idea.

Keywords: neutron, pietzonuclear, steel, iron grating defect, black hole, granite, mineral, hopkinson.

GJRE-E Classification: FOR Code: 090599

Strictly as per the compliance and regulations of:

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The most extravagant aspect is the one linked to the compression or pressure force which can be obtained either directly by applying two plates which surround our granite or by a centrifugal force or by a radial acceleration which arises from the rotation of our granite. device; all this was born from a "very strange" idea to plug a black hole with an explosion because the uncontrolled generation of neutrons due to the compression should find its culmination in a very high rotation and a corresponding very high pressure, all this is crazy but is the basic idea that inspired this work.

The generation of neutrons with a compressive effect on certain minerals is due to the much discussed so-called "piezonuclear" phenomenon and in any case it seems interesting combined with the Hopkinson circuit famous for its magnetic circuits and with another device; the similarity of the first arises from the idea of constructing a path that allows the circulation of neutrons in a circuit made up of mineral elements and not only but certainly of common materials in order to (as the title says) if one can observe the generation uncontrolled emission (at times) of neutrons which can trigger a particular response in a circuit similar to a Hopkinson equivalent circuit which we can call a "neutron circuit" where the path of N is to verify the existence of a possible maintenance of the emission of neutrons but to verify if this emission can be increased, controlled in a certain sense. Two methods will be presented, one "symmetrical" and one "radial" with radial production axial control with open control chain and the second with rotation and tangential-centrifugal production and radial control.

Keywords: neutron, pietzonuclear, steel, iron grating defect, black hole, granite, mineral, hopkinson.

I. Introduction

In this work we try to examine some aspects of the controversial phenomenon of the generation and emission of neutrons from granite in particular (in materials containing iron) conditions of pressure or breakage of the same. In this report, two types of "circuits" or patterns are examined: the first is the more traditional in principle, i.e. a compression that should concentrate the neutrons generated in a geometrically confined space (*couvette*), in the second instead, we do more, we see if inside it we try to make an ideal experiment in the which the origin of the neutron emission is questioned is due to the defect of the iron lattice; there is a technological gap that must be overcome both for the creation and for the positioning of the rod with the defect of the lattice in a certain position and therefore an attempt is made to compress a small thin film obtained thanks to the overcoming of technological difficulties not yet available.

In order to be able to implement what has just been proposed, reference is made to a principle diagram already described in *[7]* and represented in the following figure *Fig. [1]*.

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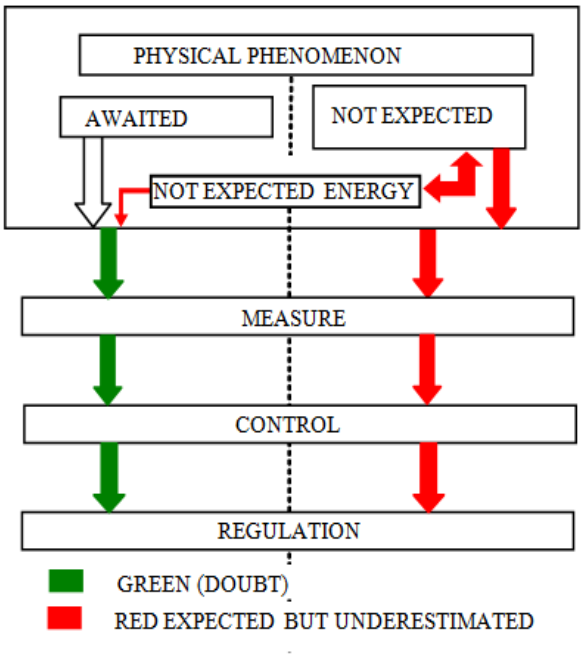

Figure 1: Steps of the process of a measurement, the arrows represent both the energy flow out of each block and the input for the next block, these blocks are intended both in physical and conceptual terms and/or in method

II. Schemes Used

This paragraph will describe two devices visible in *Fig. 2* and in *Fig. 3* respectively, both have the presumption of being able to produce neutrons and be able to centralize them in a confined space "cuvette" which can be made of quartz or other useful materials in order to contain them *[25]*, *[26]*.

The first device is a traditional version; that is, by compressing small granite cubes with steel disks, neutrons can be emitted which, by symmetry, are concentrated in the *cuvette*. This first device is very important because it is traditional, there is a controversial principle scheme *[9]-[24]* and inside the *cuvette* there may be a measuring instrument or other; this *cuvette* is led to the center of the device thanks to a string connected to the pliers and which represents the possibility of interaction with the material contained in the confined space with the centralized neutrons allowing us to affirm that the system has radial production and axial control, a condition of interaction difficult to reach however how to release the grippers, represented for simplicity (in gray), which when pressed concentrically allow the *cuvette* to lower towards the center of the device and at the same time when they are released it moves away therefore, there is a sort of feedback control negative with respect to approaching the material with which the neutrons should interact.

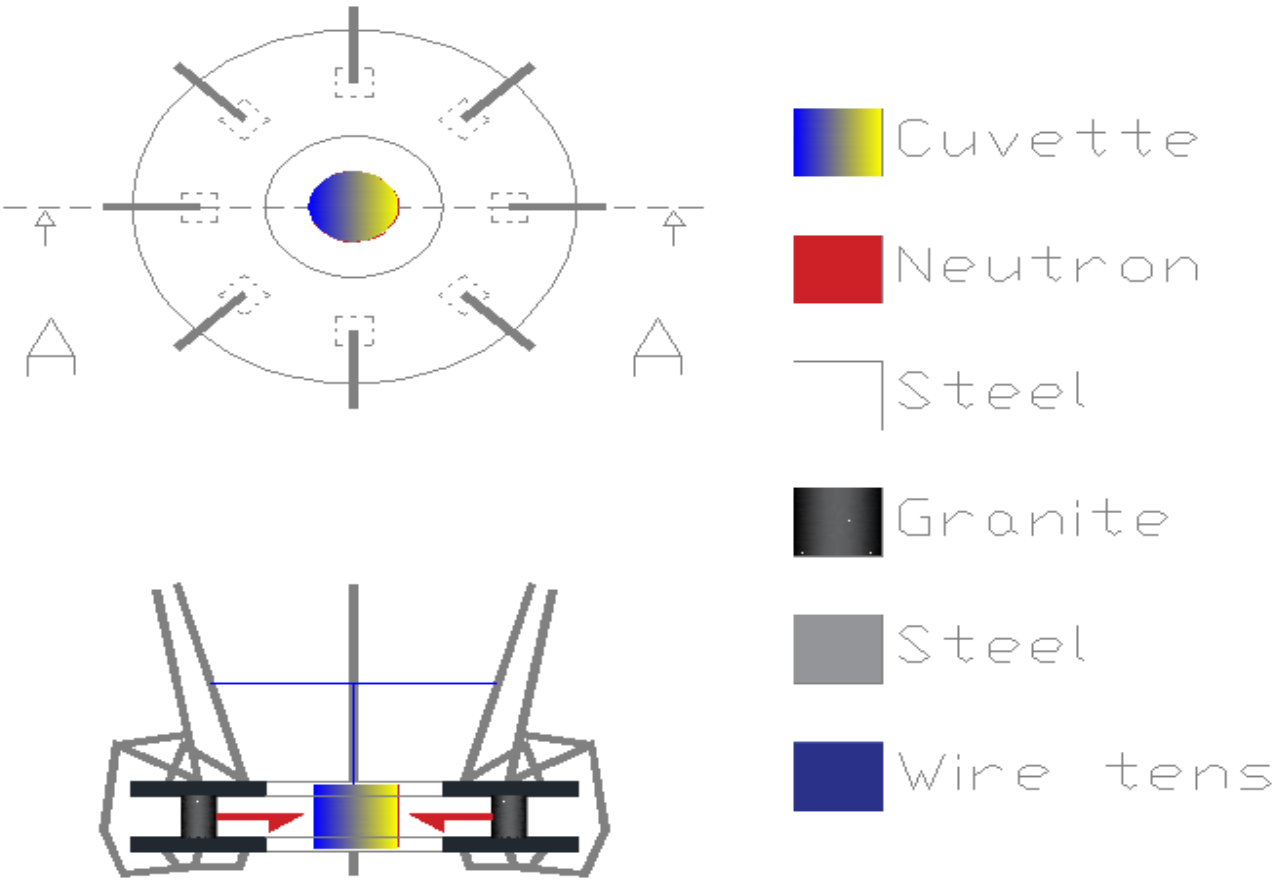

Figure 2: First device that presumably to emit neutrons with axial compression action

This device just described which is compared with the device represented in *Fig. 3* in which instead, we try to understand if the emission of neutrons, always concentric by symmetry, without control, can be obtained once the number of revolutions has been reached and these they can also be overcome without any form of feedback. Thanks to the speed reached the emission of neutrons, probable or not, is obtained thanks to the compression of thin films of iron atoms containing the lattice defect *[21], [22]*. We want to understand if the N emission in the granite quartzes of the first device and in the second roughly correspond to what we expect and this could mean that the neutron emission is due to the defect of the iron lattice. In order for this to be possible, it is necessary to overcome a technological gap, i.e. isolate the pieces of granite that have a percentage of iron with more frequent defects or insert the iron with the defect. These two devices originated from the one present in the appendix, but obviously we repeat: the first device allows radial generation due to compression and with axial feedback, the century instead thanks to the rotation and the centrifugal force the iron is compressed with the defect thanks to the lead and for symmetry the N are concentrated in the center of the device. These two devices have the purpose of verifying if this N emission exists and of measuring and if this emission is mainly due to the defect of the iron grating.

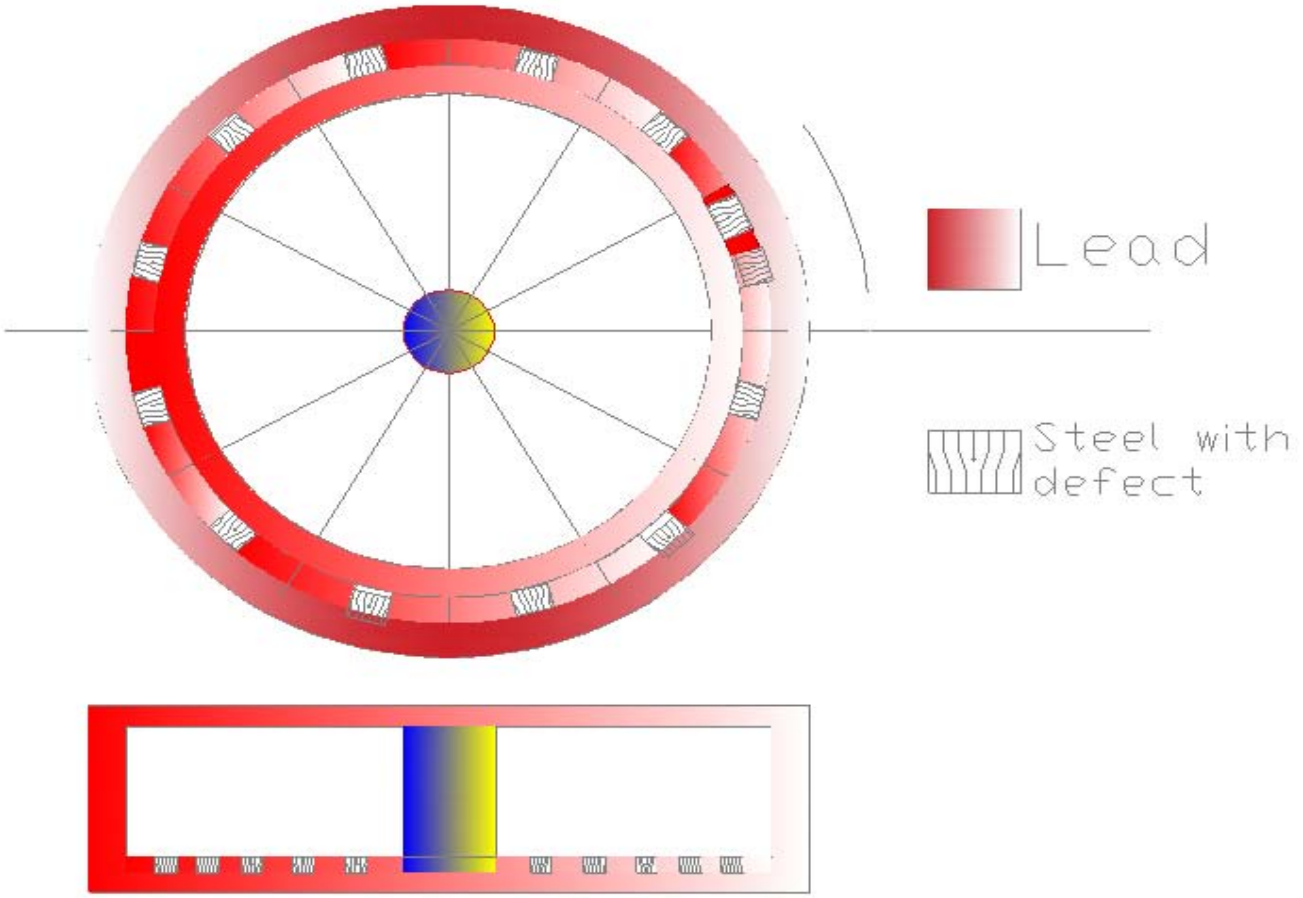

Figure 3: Second device that presumably to emit neutrons with radial compression action

III. Consideration

In this work we have taken care of verifying that the production of N can exist thanks to the axial compression or to the compression due to the centrifugal action. The two devices can be made as in figures *2* and *3*; the second has a particular expedient which requires the overcoming of certain technical gaps. In this work two methods for N concentration are compared; all this emerged thanks to an original idea visible in appendix A which currently remains a rebus as we initially wanted to combine a neutron generator (split into two devices) that resembled the so-called *Hopkinson* circuit, and this is still not there for me possible because in addition to being physically disabled a lot of time has passed and therefore the readers are left with the possibility of completing the rebus; that is, what expedients can be implemented to ensure that there is a "*Hopkinson*" circuit that allows the circulation of the Ns and not only their creation, the graphics of the rebus are present in the appendix.

IV. Conclusion

In this article, in addition to all that has already been exposed, the ambition if the devices should "shine" from the point of view of the generation of N is to represent what is present in a layer of the coat of a neutron star; this is a mystery due to the existence of possible difficulties in realizing the devices while neutron stars are well known to the scientific community. It is also true that this project in reference to figure *0* developed from a grotesque, paradoxical idea which was to plug a black hole (the device in *Fig. 2* for black holes without spin and the one in *Fig. 3* for those with spin) thanks to the uncontrolled generation of N and consequent "explosion" which undermined the existence of the black hole and its ability to aggregate mass. All this at the beginning seemed paradoxical and simply a source of great imagination, aspects that can be deduced from the rebus, that the reader will find something interesting to think about it further. We have gone from that imaginative, childish, grotesque requirement to that of making sure that a *Hopkinson*-type circuit could be developed for N leading then to the realization of an experiment that would give "merit" to the defect of the iron lattice, a differential diagnosis of the two devices can be made. In fact in the first the iron is present in the granite in a homogeneous and anisotropic way in the second instead only the iron with the defect in the lattice is compressed. The reader can draw ideas and conclusions that stimulate him suitable for the objectives or for other things.

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Appendix

The main aspect of this work is represented by a personal journey that originated from the basic idea represented by the fig. "0" in the appendix, that is that is a set of normal and common physical objects that should have allowed an excess of energy, in common and inactive materials, thanks to the emission of neutrons and with the defect of the iron lattice inside them. This initial idea resembled the so-called "*Hopkinson circuit*" for magnetic circuits, but this idea has remained an enigma due to the passage of years, due to some distractions and my state of health it has not been possible for me to fully review this device, i.e. pieces missing, mechanisms, combinations, tricks and therefore for me it remains a rebus and I think it will remain so for the reader too; I wanted to offer it to you because it is the starting idea that allowed us to reflect on the continuation of this work that led to the two devices represented in figures 1 and 2. This aspect is not insignificant because it represents a peculiarity that should characterize every researcher, scientist and popularizer, or sincerity. It all started from this rebus represented in fig. 0, and the more one thinks about it, the more perhaps one arrives at the solution by obtaining the phantom neutron generator with or without control. Instead, the two devices are the "necessary" becoming of the original idea that I got from myself.

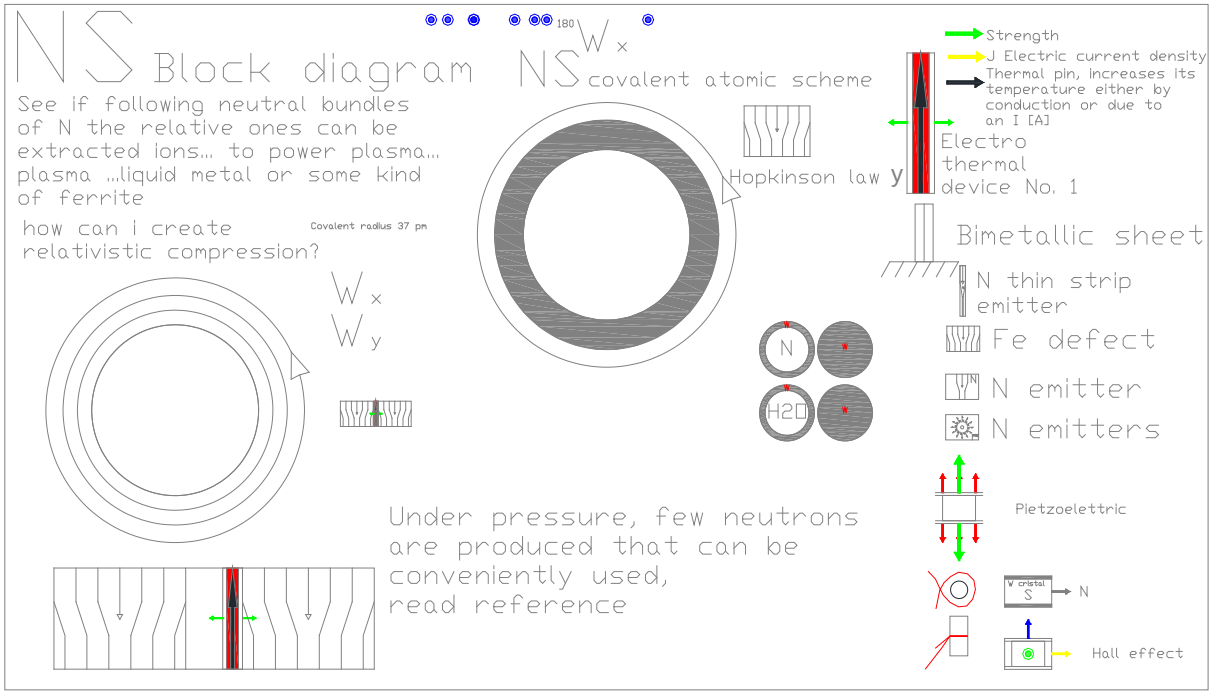

Figure 0: Graphic representation of the primordial idea

References Références Referencias

1. Francesco Pia “I will be back”, pp. 149, Ed. Amazon® Kdp, January 2019.
2. Francesco Pia “The liar knee”, pp. 224, Ed. Amazon® Kdp, July 2019.
3. Francesco Pia “Genetic geometry”, pp. 80, Ed. Amazon® Kdp, January 2019.
4. Francesco Pia "JEWEL: a cosmological model due to the geometrical displacement of galactic object like black, white and worm holes", ICCEA 2021: 15. International Conference on Cosmology and Extragalactic Astronomy; July 19-20, 2021 in Toronto, Canada.
5. Francesco Pia "How to Try to Get Antigravity From Electrical Circuits by an Almost Magnetic Monopole or from Anti Matter" in IRJAES, Volume 7, Issue 3, Date: 25/06/2022.
6. Francesco Pia "A Computer System Based On Neural Network And Rules System Based For Find An Optimum Mix of Vaccine And/Or Drugs For mRNA Like Covid-19 Virus And Other Pathologies" in IRJAES, Volume 7, Issue 2, Date, 09/06/2022.
7. Francesco Pia “POLIFEMO: a Teleportation Model Based on Object Like Black, White and Worm Hole for Electric Signal and Object Also Thinking and With Conscience” ID: IRJAES-V7N3P66Y22 June-

Aug 2022 Issue Vol. 7 Issue 3 https://irjaes.com/volume-7-issue-3/.
8. Francesco Pia “A Symmetry of Cosmological Model Named Jewell That Allows Re Entry Into The Starting Parallel Universe With Adequate Teleportation Based on Creation of Useful Stellar Object Like Black, Withe Holes”, ICES-23-P1159, ICES2023, 6-8 February 2023, Riyadh, Saudi Arabia.
9. Fabio Cardone "La futura energia. Dall'atomica alle reazioni nucleari ultrasoniche" 9788883233005 Di Renzo Editore, 2016.
10. F. Cardone, A. Carpinteri, G. Lacidogna “Piezonuclear neutrons from fracturing of inert solids”, in Phys. Lett. A, vol. 373, n. 45, 2009, pp.4158-4163.
11. F. Cardone, R. Mignani e A. Petrucci “Piezonuclear decay of thorium, in Physics Letters A, vol. 373, 11 may 2009, pp. 1956–1958, DOI: 10.1016/j.physleta.2009.03.067.
12. Honglai Tan, Wei Yang, “Catastrophic fracture induced fracto-emission], in Journal of Materials Science, vol. 31, n.n10, 1996.
13. Ericsson, G., Pomp, S.; Sjöstrand, H.; Traneus, E. “Piezonuclear reactions - do they exist?”, 2009.
14. Ericsson, G., Pomp, S.; Sjöstrand, H.; Traneus, E., Comment on “Piezonuclear decay of thorium” [Phys. Lett. A 373 (2009) 1956], 2009.
15. Kowalski, Comment on “Piezonuclear decay of thorium” [Phys. Lett. A 373 (2009) 1956], in *Physics Letters A*, vol. 374, 11 January 2010, pp. 696–697, DOI10.1016/j.physleta.2009.11.056.
16. F. Cardone, R. Mignani, A. Petrucci, Reply to the "Comment on 'Piezonuclear decay of thorium' [Phys. Lett. A 373 (2009) 1956]" [Phys. Lett. A 373 (2009) 3795] by G. Ericsson et al, 2009.
17. Ericsson, G., Pomp, S.; Sjöstrand, H.; Traneus, E., Comments on the "Reply to 'Comment on "Piezonuclear decay of thorium" [Phys. Lett. A 373 (2009) 1956]' [Phys. Lett. A (2009, in press]" [Phys. Lett. A (2009), in press] by F. Cardone et. al, 2009.
18. Marco Cattaneo, Pensatori contemporanei, su *cattaneo - lescienze.blogautore.espresso.repubblica.it*, 20 novembre 2007.
19. Quinto brevetto per la generazione di neutroni mediante pressione ultrasonica, su *24o.it*.
20. Sylvie Coyaud, Piezopoli, thriller all'italiana, su *ilsole24ore.com*.
21. Manuale di Elettronica e Telecomunicazioni, Hoepli.
22. A. Bandini Buti, M. Bertolini "Elettrotecnca Pratica, elementi fondamentali, 1"; Edtoriale Delfino Milano, 4a edizione, 1978.
23. Bertetto A.M., Grosso B., Ricciu R., Rizzu D.," Anisotropic and impulsive neutron emissions from brittle rocks under mechanical load", 2015, "Meccanica","50","5",,"1177","1188".
24. Alberto Carpinteri, Giuseppe Lacidogna, Amedeo Manuello e Oscar Borla “Piezonuclear Fission Reactions from Earthquakes and Brittle Rocks Failure: Evidence of Neutron Emission and Non-Radioactive Product Elements (abstract), in Experimental Mechanics” vol. 53, n. 3, New York, Springer, 1° marzo 2013, pp. 345-365, DOI:10.1007/s11340-012-9629-x, ISSN 0014-4851 (WC · ACNP).
25. Roberto Li Voti, Grigore L. Leahu, Simone Gaetani, Concita Sibilia, Vittorio Violante, Emanuele Castagna and Mario Bertolotti “Light scattering from a rough metal surface: theory and experiment”, Vol. 26, No. 8/August 2009/J. Opt. Soc. Am. B 1585.
26. Sylvain Petitgirard, Christoph J. Sahle, Wim J. Malfait, Georg Spiekermann, Ingrid Blanchard, Eleanor S. Jennings, Marine Cotte, and Motohiko Murakami" Anomalous density, sound velocity, and structure of pressure-induced amorphous quartz", Phys. Rev. B 105, 134106 – Published 14 April 2022.

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By Abed Alhakim Ibrahim Shehadeh Khaleel, Mohammad Amin Yousef Ibrahim Abu Shinnar & Qusai Zakaria M.Abuhadba-Abushunnar

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1- The number of layers of carbon fiber.
2- Rotate the edges of the samples.

The analytical results showed good agreement with the experimental results, and the analytical model showed the importance of the fibers.

Rounded cross-section edges and the number of carbon fiber layers increase the bearing capacity of the concrete columns, also rounding the edges of the column prevented the concentration of stresses and contributed to the increase of the enclosing area.

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I. Introduction

The cracking and fragmentation that occurs in concrete columns are often accompanied by steel submission.

Reinforcement and its inability to bear, recently the most common method to strengthen the structural elements is the use of steel reinforcement and the application of steel shirts on concrete columns. The use of these shirts provided the horizontal encirclement of the concrete and showed apparent effectiveness in increasing the bearing capacity of the concrete columns. However, the primary defects using of steel shirts are that their corrosion resistance is low and their cost is high in addition to their heavy weight.

Fiber Reinforced Polymers (FRP) appear to be an alternative and practical choice, due to their high strength and hardness relative to their weight, and their corrosion resistance. Therefore, using these materials has become the subject and goal of many studies in recent years due to its many advantages.

II. Research Objective

The research aims to introduce polymers, their types, and their structural uses.

III. Research Importance

The importance of the research comes from the need to develop construction building materials and use materials with low cost and high durability in building and construction.

IV. Research Problem

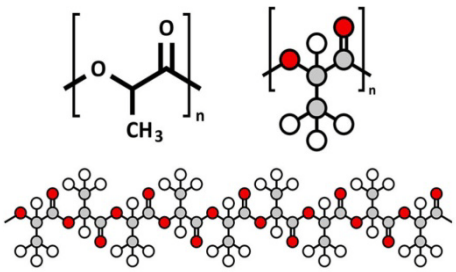
The research problem comes from the research question, which is:

What are polymers and reinforced polymer fibers, and how are they used?

V. Search Terms

a) Polymers

Polymers are materials made of long, repeating chains of molecules. These materials have unique properties, depending on the type and how they are bonded.



b) Fiber Reinforced Polymer (FRP)

It is a composite material made of a polymeric network reinforced with fibers; which is usually made of glass, Carbon, aramid, or basalt. These fibers are distinguished in their use in construction fields and have distinctive properties with concrete as they produce potent compounds that increase the hardness and resistance of concrete when adding it to it and also enhance its dynamic properties.

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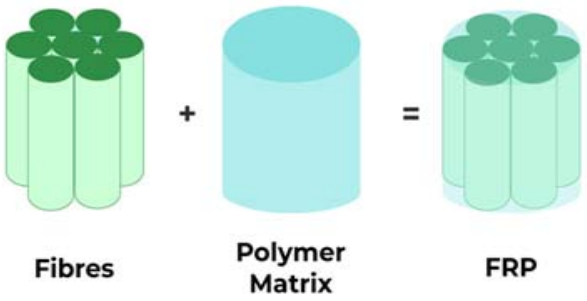


VI. Fiberglass Polymer (FRP) Features

a) Lightweight

FRP has a density of approximately 14-21 kN/m3, which is only about one-sixth to one-fourth that of steel and even lighter than aluminum. When used in large-span structures, FRP can significantly reduce the weight of the structure. For instance, the entire carbon fiber roof of the Job Theater weighs only 80 tons and can be erected through lifting. With a roof diameter of around 47 meters, the average weight per square meter is approximately 46 kg, which is comparable to that of a 6 mm thick steel plate. This remarkable weight reduction effect enables the roof to support the weight of surrounding structural glazing, creating a stunning spatial effect.

b) High Strength

Natural materials often contain defects in their crystal structure. Finer materials tend to have fewer defects and higher strength. The strength of carbon and glass fibers can be 10-20 times that of steel. Due to the strength difference between fibers and matrix, the strength-to-weight ratio of FRP materials is typically more than four times that of steel, enabling FRP structures to have larger spans than traditional structures. For instance, researchers have used CFRP cables to construct the 10,000-meter-long Gibraltar Bridge, which demonstrates the remarkable strength of FRP materials.

c) Easy to Shape

The production of FRP involves several methods, including extrusion, rolling, hand laying, and injection molding. While it may not be feasible to manufacture FRP products on a large scale, sheets of almost any shape can be produced to create non-linear architectural forms.

d) Easy to Disassemble and Assemble

e) Modulus of Elasticity

The modulus of elasticity of FRP is equivalent to that of concrete and wood. Compared with its high strength, structural design is often controlled by deformation. Deformation can be controlled by a reasonable selection of structural shape, combination with other materials, and prestressing.

f) Linear Expansion Coefficient

Much smaller than steel, aluminum, and other metallic materials. On the one hand, it will not cause apparent temperature stress when applied to very tall structures, conducive to structural design; On the one hand, it has a better thermal insulation effect, and an additional insulation layer is no longer needed for the building to save building space.

g) Fire Resistance

The resin will soften at high temperatures and lead to decreased mechanical properties. FRP + surface fire-retardant treatment method can improve the resin's fire-retardant performance. The fireproof effect of well-cured FRP can be equivalent to that of concrete.

Economical: The price of FRP material is higher than that of steel. However, the overall cost is competitive, due to their lightweight, high strength, corrosion resistance, and low maintenance requirements.

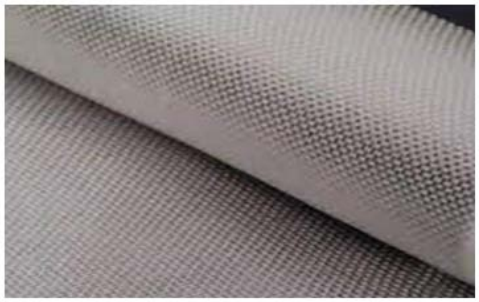
VII. Disadvantages of Polymer Fibers

The negatives can be summarized as follows:

1- The high cost of materials despite the increased usage in recent years.
2- Low deformation at collapse, which requires suitable design methods.
3- Low lateral bearing capacity due to poor mechanical properties, especially For FRP not Aramid.
4- Expansion due to moisture absorption, especially for FRP from not Aramid (Aramid FRP).
5- Rapid and severe loss of bonding, resistance, and hardness at high and extreme temperatures the thing in the event of a fire.

VIII. Types of Polymer Fibers

a) Glass Fiber Reinforced Polymers (GFRP)



Glass fiber is mainly made by mixing silica sand, limestone, folic acid, and other minor ingredients. The mixture is heated until it melts at about 1260°C.

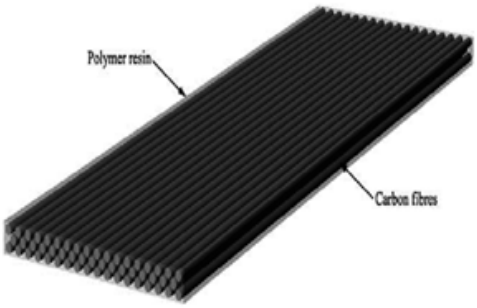
The molten glass is then allowed to flow through the tiny holes in a platinum plate, forming threads. The glass filaments are cooled and bundled. The fibers are pulled to increase their directional strength. The fibers are then spun into various shapes for use in vehicles.

Properties:

Based on aluminum-borosilicate lime composition, glass fibers are the dominant reinforcement of reinforced polymer composites due to their excellent electrical insulating properties, low susceptibility to moisture, and high mechanical properties.

Glass is generally a good impact-resistant fiber but weighs more than Carbon or aramid. Fiberglass has excellent properties equal to or better than iron in specific applications.

b) Carbon Fiber Reinforced Polymers (CFRP)

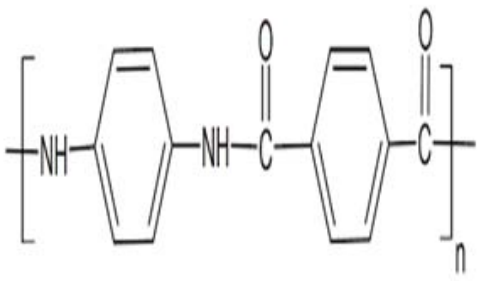


Carbon fiber has a high modulus of elasticity, 200-800 GPa. The final extension is 0.3 - 2.5%, where lower extension corresponds to higher hardness and vice versa.

Properties:

Carbon fiber does not absorb water and it resists to many chemical solutions. Carbon fiber has excellent bearing stresses, does not wear out.

c) Aramid Fiber Reinforced Polymers (AFRP)



Aramid is the short component for aromatic polyamide. There are many brands of aramid fiber, but the well-known one is Kevlar, and the others are Twaron, Technora, and SVM.

The fiber size is 70 - 200 GPa with a final elongation of 1.5 - 5%, depending on the quality. Aramid has high breaking energy and is therefore used for bulletproof helmets and clothing.

Properties:

Aramid fibers are sensitive to high temperatures, humidity, and UV rays and are, therefore, not widely used in civil engineering applications. Finally, aramid fibers have problems relaxing and corroding under stress.

IX. Applications and Structural uses of FRP Fiber-reinforced Polymers

- Prestressed concrete applications that require high resistance to corrosion and electromagnetic transparency often use Carbon FRPs, also known as CFRP.
- In offshore platforms, underwater piping, and other structural parts, CFRP composites are commonly used. Additionally, FRP reduces fire hazards.
- Carbon fiber reinforced polymers are used to manufacture underwater pipes that can reach great depths due to their lower density, which provides a significant increase in buoyancy compared to steel.
- To reduce weight and resist wear, stairs and hallways can be constructed using FRPs.
- High-performance hybrid architectures often incorporate FRPs.
- To increase durability, FRP bars are used as internal reinforcement for concrete structures.
- Various structures made from concrete, masonry, timber, and even metal can be reinforced with FRP bars, sheets, and strips.
- FRPs are utilized in seismic rehabilitation and restoration projects.
- Fiber-reinforced polymers are employed in the construction of special structures that require electrical neutrality.
- AFRP's high energy absorption capacity makes it suitable for reinforcing engineering structures that are subjected to dynamic loads.

X. Reinforcing Concrete Beams using Fiber-reinforced Polymer

What does it mean to strengthen concrete beams with fiber-reinforced polymer?

Reinforcing a reinforced concrete beam with fiber reinforced polymer involves installing rods made of this material close to the surface of the beam. There are several factors that can reduce the maximum load capacity of concrete structures, including corrosion of steel in aggressive environments, errors in design calculations, and poor mix design. Demolishing and rebuilding dilapidated structures is also not cost-effective.

As such, it is of paramount importance to enhance and fortify the peak capacity of structures or restore their strength in cases of degradation. Numerous methods and techniques have been employed to improve reinforced concrete elements, including the use of externally bonded panels consisting of steel panels and fiber-reinforced polymer layers. Among these methods is FRP near-surface composite technology, which has proven effective in enhancing reinforced concrete elements.

Procedures of the Near Surface Fixed Fiber Reinforced Polymer Technology:

1. Cut grooves on the crossbar cover along the tension side.
2. Use the brush and compressed air to remove debris in the grooves.
3. The last epoxy or plaster cement is inserted into the two-thirds ratio of the groove as a binder.
4. The fiber reinforced polymer tape is pushed into the binder materials until it is surrounded by the bonding agent.
5. Subsequently, the remaining portion of the groove is filled with epoxy putty.

In this process, the steel reinforcement must be prevented from cutting or the element will lose all

capacity. Therefore, the covering of the reinforced concrete part must be at least 20 mm thick to be strengthen in this way.

XI. Studies on Columns Surrounded by Carbon-reinforced Polymer Fibers

Several theoretical and experimental studies have been conducted to calculate the bearing capacity of encircled concrete columns with carbon fibers and most of the studies considered the effect of covering the circular columns, noting that. Square or rectangular cross-sections are used more in our practical reality, so the focus has been placed this research to conduct an analytical study on a model of square-shaped and loaded column pivotally.

To determine the bearing capacity of the columns, it is necessary to create an experimental model that forecasts how the columns will behave.

- A predictive experimental model must be established to ascertain the bearing capacity of the columns.
- The columns' bearing capacity can be determined by developing an experimental model that predicts their behavior.
- By applying both transverse reinforcement and carbon fibers, the columns were formed with combined banding.

Since in rectangular columns, the lateral pressure is generally different in both directions. The behavior of concrete is described by the stress-deformation curves E and H. Linear and flexible curves up to 30% of the maximum resistance of concrete to pressure, and this increases. The curve is gradually above this point until (70-90%) of the ultimate resistance to stress.

Immediately after the ultimate value, the stress-deformation curve descends; this part of the curve is determined ductility of concrete. After the slope of the curve, refraction occurs at the maximum deformation (10) E$\boldsymbol{cu}$ the value of maximum deformation decreases with increasing compressive strength of concrete; Deformation value depends on the bearish part is mainly based on experiments used to obtain a curve Stress-deformation. Numerous mathematical models have been presented to characterize a curve Stress-deformation of concrete includes several cases, including the study of the effect of banding with carbon fibers on unreinforced concrete models as the model provided by Lam and Teng. The method was approved by the American code (R.ACI440-08), and other researchers have conducted studies related to this topic. For instance, Kent and Park presented a model to characterize the stress-deformation curve equation for concrete, which can be used to investigate the effect of accidental delivery on circular sections. Other models have been developed for rectangular sections. Additionally, Mander et al. conducted a study on the role of encircling methods in enhancing the influence of longitudinal and transverse reinforcement for both circular and rectangular sections.

XII. The Future of Polymers

Scientists are actively exploring and testing various novel types of polymers to improve drug development and enhance everyday products. One promising area of research involves the use of carbon polymers in the automotive industry, which is currently being developed and promoted.

"Carbon fiber reinforced polymer composites – also called carbon fiber laminates – are the next generation materials for making cars lighter, more fuel efficient, and safer. Carbon sheets are solid and rigid due to their woven layers of pure carbon fibers combined with a rigid plastic composite," according to a study by two researchers, Nikhil Gupta and Steven Zeltman, in the Mechanics of Composite Materials Lab, Department of Mechanical and Aerospace Engineering, NYU Tandon.

Polymer is also used in hologram enhancement. Scientists at the University of Pennsylvania created a hologram on a flexible polymer material embedded in gold nanoparticles, according to a study published online in early 2017 in the journal NanoLetters. The new hologram device can take several pictures instead of just one.

Ritesh Aggarwal, a researcher and professor of materials science and engineering at the University of Pennsylvania, asks a question and says: "Can we encode a lot of information in a 3D image?" "It's an important piece of work," he adds, "because it's the first time someone has shown you can record multiple 3D images, and with stretch polymers, you can change the whole idea.

Factors affecting the design of FRP:

XIII. There are Several Factors Affecting The Design of FRP, Namely

- The spacing between grooves.
- The thickness of concrete between the FRP bars and steel.
- Concrete compressive strength.
- The axial stiffness of FRP rods.
- Perimeter reinforcement using FRP rods.
- The ratio of FRP to steel reinforcement.
- The distance between reinforcing edge and grooves.
- And types of failures in reinforced concrete beams.

XIV. Conclusions

In the following research, we reached many conclusions, including:

- The need to use polymer fibers of various types in construction and construction.
- Polymer fibers have several advantages and benefits, including:
- Carbon fiber fabric has lightweight, as its density is not more than ¼ of steel's.
- The strength of the carbon fiber fabric is so high that 1mm of this fabric is sufficient to replace the reinforcement without any increase in the weight or cross-section of the supporting element.
- The carbon fiber fabric is very single-curved as it can be applied to elements in any geometric shape and a narrow space.
- Applying unidirectional carbon fiber fabric is straightforward and does not require substantial mechanical devices or complex equipment.
- The applicability of the unidirectional carbon fiber fabric is very high, as it can be applied as reinforcement on concrete, wooden, and masonry structures.
- And we find that the polymer fibers have several disadvantages, including:

a) Double Long-term Temperature Resistance

In general, FRP is not suitable for prolonged use at high temperatures. The strength of general-purpose polyester FRP significantly decreases below 50 degrees Celsius and is typically used only below 100 degrees Celsius. Similarly, the strength of general-purpose epoxy FRP reduces above 60 degrees Celsius. However, it is feasible to select a high-temperature resistant resin that can enable long-term operation at temperatures ranging from 200 to 300°C.

b) Aging Phenomenon

Aging is a common defect of plastics, and FRP is no exception. It is easy to cause performance deterioration under the influence of ultraviolet rays, sand, rain, snow, and chemical and mechanical stress.

c) Low Shear Strength

The interlaminar shear strength of the resin is quite low, which can be improved by selecting an appropriate process, using a coupling agent, and most importantly, avoiding shearing between layers during product design. Enhancing the adhesion between layers is crucial for improving the overall strength of the product.

References Références Referencias

1. C. Ershad "Behaviour of Fibre Reinforced Polymer Confined Reinforced Concrete Columns under Fire Condition" Kingston, Ontario, Canada, 2009.
2. ACI Committee 440. Guide for the Design and Construction of Externally Bonded FRP Systems for Strengthening Concrete Structures; ACI 440.2R-08 American Concrete Institute: Farmington Hills, MI, USA, 2008.
3. H. E., A Study of Combined Bending and Axial Load in Reinforced Concrete Members, Illinois: University of Illinois Engineering Experiment Station, 1951.
4. P. S., "Review of Stress-Strain Relationships for Concrete," ACI Journal Proceddings, vol. 67, no. 3, pp. 243-248, 1970.
5. Lam, L.; Teng, J.G. Design-Oriented Stress-Strain Model for FRP-confined Concrete in Rectangular Columns. J. Reinf. Plast. Compos. 2003, 22, 1149–1186.
6. P. R. Kent DC, "Flexural Members with Confined Concrete," J Struct EngASCE, vol. ST7, no. 97, 1971.
7. Mander, J. B.; Priestley, M.J.N.; Park, R. Seismic design of bridge piers; Research Report No. 84–2; University of Canterbury: Christchurch, New Zealand, 1984.
8. ANSYS. Manuals, 2015.
9. M. W. Hadi, "Axial and flexural performance of square RC columns wrapped with CFRP under eccentric loading," Journal of Composites for Construction, vol. 16, no. 6, pp. 640-649, 2012.
10. https://www.researchgate.net/publication/.
11. Choi. H. T.; West, J. S.; Soudki, K. A., 2008, Analysis of the flexural behavior of partially bonded FRP strengthened concrete beams' journal of composites for construction, /July/August., P375-286.
12. Taljsten, B., 2003, FRP strengthening of existing concrete structures design guidelines, lulea university printing office: lulea, sweden,.
13. Dussek I. J., 1974, Strengthening of bridge beams and similar structures by means of epoxy resin bonded external reinforcement, Transport research record, National Research Council, No. 785, 1974, pp21-24.
14. https://theconstructor.org/concrete/using-nsm-frp-rc c-beam-strengthening/13238/.

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Acknowledgments

Contributors to the research other than authors credited should be mentioned in Acknowledgments. The source of funding for the research can be included. Suppliers of resources may be mentioned along with their addresses.

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The following is the official style and template developed for publication of a research paper. Authors are not required to follow this style during the submission of the paper. It is just for reference purposes.

Manuscript Style Instruction (Optional)

- Microsoft Word Document Setting Instructions.
- Font type of all text should be Swis721 Lt BT.
- Page size: 8.27" x 11'", left margin: 0.65, right margin: 0.65, bottom margin: 0.75.
- Paper title should be in one column of font size 24.
- Author name in font size of 11 in one column.
- Abstract: font size 9 with the word "Abstract" in bold italics.
- Main text: font size 10 with two justified columns.
- Two columns with equal column width of 3.38 and spacing of 0.2.
- First character must be three lines drop-capped.
- The paragraph before spacing of 1 pt and after of 0 pt.
- Line spacing of 1 pt.
- Large images must be in one column.
- The names of first main headings (Heading 1) must be in Roman font, capital letters, and font size of 10.
- The names of second main headings (Heading 2) must not include numbers and must be in italics with a font size of 10.

Structure and Format of Manuscript

The recommended size of an original research paper is under 15,000 words and review papers under 7,000 words. Research articles should be less than 10,000 words. Research papers are usually longer than review papers. Review papers are reports of significant research (typically less than 7,000 words, including tables, figures, and references)

A research paper must include:

a) A title which should be relevant to the theme of the paper.
b) A summary, known as an abstract (less than 150 words), containing the major results and conclusions.
c) Up to 10 keywords that precisely identify the paper's subject, purpose, and focus.
d) An introduction, giving fundamental background objectives.
e) Resources and techniques with sufficient complete experimental details (wherever possible by reference) to permit repetition, sources of information must be given, and numerical methods must be specified by reference.
f) Results which should be presented concisely by well-designed tables and figures.
g) Suitable statistical data should also be given.
h) All data must have been gathered with attention to numerical detail in the planning stage.

Design has been recognized to be essential to experiments for a considerable time, and the editor has decided that any paper that appears not to have adequate numerical treatments of the data will be returned unrefereed.

i) Discussion should cover implications and consequences and not just recapitulate the results; conclusions should also be summarized.
j) There should be brief acknowledgments.
k) There ought to be references in the conventional format. Global Journals recommends APA format.

Authors should carefully consider the preparation of papers to ensure that they communicate effectively. Papers are much more likely to be accepted if they are carefully designed and laid out, contain few or no errors, are summarizing, and follow instructions. They will also be published with much fewer delays than those that require much technical and editorial correction.

The Editorial Board reserves the right to make literary corrections and suggestions to improve brevity.

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It is necessary that authors take care in submitting a manuscript that is written in simple language and adheres to published guidelines.

All manuscripts submitted to Global Journals should include:

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The title page must carry an informative title that reflects the content, a running title (less than 45 characters together with spaces), names of the authors and co-authors, and the place(s) where the work was carried out.

Author details

The full postal address of any related author(s) must be specified.

Abstract

The abstract is the foundation of the research paper. It should be clear and concise and must contain the objective of the paper and inferences drawn. It is advised to not include big mathematical equations or complicated jargon.

Many researchers searching for information online will use search engines such as Google, Yahoo or others. By optimizing your paper for search engines, you will amplify the chance of someone finding it. In turn, this will make it more likely to be viewed and cited in further works. Global Journals has compiled these guidelines to facilitate you to maximize the web-friendliness of the most public part of your paper.

Keywords

A major lynchpin of research work for the writing of research papers is the keyword search, which one will employ to find both library and internet resources. Up to eleven keywords or very brief phrases have to be given to help data retrieval, mining, and indexing.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy: planning of a list of possible keywords and phrases to try.

Choice of the main keywords is the first tool of writing a research paper. Research paper writing is an art. Keyword search should be as strategic as possible.

One should start brainstorming lists of potential keywords before even beginning searching. Think about the most important concepts related to research work. Ask, “What words would a source have to include to be truly valuable in a research paper?” Then consider synonyms for the important words.

It may take the discovery of only one important paper to steer in the right keyword direction because, in most databases, the keywords under which a research paper is abstracted are listed with the paper.

Numerical Methods

Numerical methods used should be transparent and, where appropriate, supported by references.

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Authors must list all the abbreviations used in the paper at the end of the paper or in a separate table before using them.

Formulas and equations

Authors are advised to submit any mathematical equation using either MathJax, KaTeX, or LaTeX, or in a very high-quality image.

Tables, Figures, and Figure Legends

Tables: Tables should be cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g., Table 4, a self-explanatory caption, and be on a separate sheet. Authors must submit tables in an editable format and not as images. References to these tables (if any) must be mentioned accurately.

Figures

Figures are supposed to be submitted as separate files. Always include a citation in the text for each figure using Arabic numbers, e.g., Fig. 4. Artwork must be submitted online in vector electronic form or by emailing it.

Preparation of Eletronic Figures for Publication

Although low-quality images are sufficient for review purposes, print publication requires high-quality images to prevent the final product being blurred or fuzzy. Submit (possibly by e-mail) EPS (line art) or TIFF (halftone/ photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Avoid using pixel-oriented software. Scans (TIFF only) should have a resolution of at least 350 dpi (halftone) or 700 to 1100 dpi (line drawings). Please give the data for figures in black and white or submit a Color Work Agreement form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).

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Tips for Writing a Good Quality Engineering Research Paper

Techniques for writing a good quality engineering research paper:

1. Choosing the topic: In most cases, the topic is selected by the interests of the author, but it can also be suggested by the guides. You can have several topics, and then judge which you are most comfortable with. This may be done by asking several questions of yourself, like "Will I be able to carry out a search in this area? Will I find all necessary resources to accomplish the search? Will I be able to find all information in this field area?" If the answer to this type of question is "yes," then you ought to choose that topic. In most cases, you may have to conduct surveys and visit several places. Also, you might have to do a lot of work to find all the rises and falls of the various data on that subject. Sometimes, detailed information plays a vital role, instead of short information. Evaluators are human: The first thing to remember is that evaluators are also human beings. They are not only meant for rejecting a paper. They are here to evaluate your paper. So present your best aspect.

2. Think like evaluators: If you are in confusion or getting demotivated because your paper may not be accepted by the evaluators, then think, and try to evaluate your paper like an evaluator. Try to understand what an evaluator wants in your research paper, and you will automatically have your answer. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

3. Ask your guides: If you are having any difficulty with your research, then do not hesitate to share your difficulty with your guide (if you have one). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work, then ask your supervisor to help you with an alternative. He or she might also provide you with a list of essential readings.

4. Use of computer is recommended: As you are doing research in the field of research engineering then this point is quite obvious. Use right software: Always use good quality software packages. If you are not capable of judging good software, then you can lose the quality of your paper unknowingly. There are various programs available to help you which you can get through the internet.

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6. Bookmarks are useful: When you read any book or magazine, you generally use bookmarks, right? It is a good habit which helps to not lose your continuity. You should always use bookmarks while searching on the internet also, which will make your search easier.

7. Revise what you wrote: When you write anything, always read it, summarize it, and then finalize it.

8. Make every effort: Make every effort to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in the introduction—what is the need for a particular research paper. Polish your work with good writing skills and always give an evaluator what he wants. Make backups: When you are going to do any important thing like making a research paper, you should always have backup copies of it either on your computer or on paper. This protects you from losing any portion of your important data.

9. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several unnecessary diagrams will degrade the quality of your paper by creating a hodgepodge. So always try to include diagrams which were made by you to improve the readability of your paper. Use of direct quotes: When you do research relevant to literature, history, or current affairs, then use of quotes becomes essential, but if the study is relevant to science, use of quotes is not preferable.

10. Use proper verb tense: Use proper verb tenses in your paper. Use past tense to present those events that have happened. Use present tense to indicate events that are going on. Use future tense to indicate events that will happen in the future. Use of wrong tenses will confuse the evaluator. Avoid sentences that are incomplete.

11. Pick a good study spot: Always try to pick a spot for your research which is quiet. Not every spot is good for studying.

12. Know what you know: Always try to know what you know by making objectives, otherwise you will be confused and unable to achieve your target.

13. Use good grammar: Always use good grammar and words that will have a positive impact on the evaluator; use of good vocabulary does not mean using tough words which the evaluator has to find in a dictionary. Do not fragment sentences. Eliminate one-word sentences. Do not ever use a big word when a smaller one would suffice.

Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

14. Arrangement of information: Each section of the main body should start with an opening sentence, and there should be a changeover at the end of the section. Give only valid and powerful arguments for your topic. You may also maintain your arguments with records.

15. Never start at the last minute: Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

16. Multitasking in research is not good: Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

18. Go to seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

19. Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.

20. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

21. Adding unnecessary information: Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

22. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

23. Upon conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear: Adhere to recommended page limits.

Mistakes to avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.

- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

Introduction:

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.

The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.

Approach:

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

Procedures (methods and materials):

This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

Figures and tables:

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."

Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

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	A-B	**C-D**	**E-F**
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Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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