Strength Characteristics of Recycled Aggregate Concrete by Ann

Sandela Haripriya, Boorla Rajesh , Dara Swetha Sudarshan, Md.Ikramullah khan, Bandi Bhaskar

Abstract*: Development Practices is the Key to the Next Generation for having a progressively imperative and better work concerning Engineering Perspectives. Various sorts of research have been done previously and are being done in the present on building materials extensively used for Constructions. With the ultimate objective to shield the future and proportion the trademark resources, various examinations have been coordinated over some vague period on reactions and wastes leaving undertakings, fantastically warm power plants, to facilitate the use of wastes thusly reusing them and screen the normal resources which are comprehensively using being developed practices[1-5]. A positive quantity of mortar and cement paste from the authentic concrete stays connected to stone particles in the recycled combination when demolished concrete is crushed [11,15]. The adhered mortar presence at the surface of an overwhelmed concrete mixture usually degrades the great of the recycled mixture and therefore the fresh and hardened residences of concrete crafted from it compared to herbal aggregates. As per the investigation, the compressive strength of cement was anticipated utilizing artificial neural system models Firstly, to prepare the ANN model to anticipate the compressive strength of RAC, The predicted compressive strength was contrasted and the exploratory compressive strength and correlation are carried out[12-14]. Training and testing of the ANN model are done utilizing compressive strength results of RAC collected from literature, the practical values obtained are used to validate the ANN model. Then the percentage error between the experiment and predicted compressive strength is obtained

Keywords : Aggregate, Concrete, ANN

I. INTRODUCTION

The construction requires numerous materials including concrete, metallic, glass, stone, brick, clay, dust, timber, etc. The important construction material is the cement concrete which is utilized in production companies[6-10]. In urban areas disposal of dismantled concrete has been a problem. Hence this is aggregate was recycled and used in concrete.

Getting a new product from already used material is called the recycling process. In infrastructure areas there is a maximum usage of natural aggregate resulting in the reduction of the natural resources. For sustainability the recycled aggregate will be an alternate solution. These may be obtained from demolition of roads, buildings, bridges, houses, and etc, and once in a while even from catastrophes, together with wars and earthquakes.

Figure 1: Recycled Aggregate

II. ARTIFICIAL NEURAL NETWORK:

The inputs are fed into the input layer and get accelerated through interconnection weights as they may be exceeded from the input layer to the primary hidden layer. They get summed within the first hidden layer, then processed through a nonlinear function (usually the hyperbolic tangent). Because the processed records depart the primary hidden layer, then summed and processed yet again it receives multiplied by using way of interconnection weights, by the second one hidden layer. Subsequently, the information are accelerated with the aid of interconnection weights then processed one last time inside the output layer to provide the neural network output.The MLP and plenty of different neural networks studies the usage of a set of policies referred to as backpropagation. The records are time and again supplied to the neural network. With every presentation, the mistake some of the community output and the preferred output is computed and fed decrease lower back to the neural community. The neural community uses this error to modify its weights such that the mistake can be decreased. This series of events is normally repeated until an acceptable mistakes has been reached or till the network no longer seems to be getting to know.

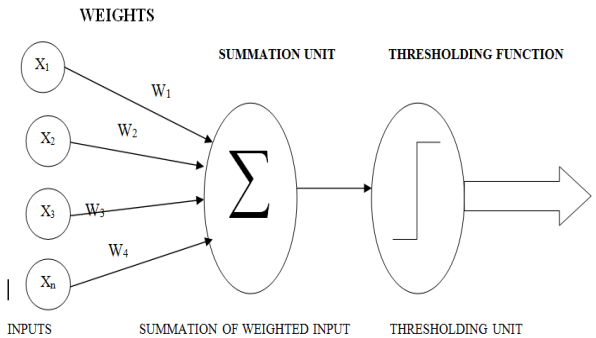


Figure 2: Simple Model on Artificial Network

Revised Manuscript Received on January 05, 2020

Sandela Haripriya* , Assistant professor, S R Engineering College, Warangal,
Boorla Rajesh, Assistant professor, S R Engineering College, Warangal,
Dara Swetha Sudarshan, Assistant professor, S R Engineering College,
Md.Ikramullah khan, Assistant professor, S R Engineering College, Warangal,
Bandi Bhaskar, Assistant professor, S R Engineering College, Warangal,

III. METHODOLOGY

1).Collection of material
2).Transport
3).Processing
4).Preliminary tests
5). Main test
a) Compressive test
b) Split tensile test

1).Collection of material

The materials required for this project that is recycling of coarse aggregate are cement, sand and recycled coarse aggregates are mainly obtained from the construction and demolished construction work the sample of about approximately 300kg from the area of Koti in Hyderabad city, the material required for this project is demolished concrete has been done due to the master plan which was held in Koti and demolished concrete sample is taken in a required quantity for the project with the permission of house owner. The sample is collected by manual picking.

The cement and sand required for the project are brought from the market. The cement used is ordinary Portland cement of 53grade of about 200kg the sand required for the project.

2).Transportation

The recycled coarse aggregate available in Koti in Hyderabad city is collected and transported by the trollies to the material testing lab of Jbiet college and ordinary Portland cement of 53grade and sand in required quantity is also transported by the trollies to the material testing lab which is of about 3km away from the Jbiet college.

3).Processing

The material collected that is demolished concrete needs to be processed to get the coarse aggregate from the harden mortar the processing is done manually testing the lab by hammering the concrete with help of hammers to separate the coarse aggregate from the demolished concrete. The coarse aggregate so obtained is again disintegrated by hammering.

To get a required size that is 20mm downsize than the crushed aggregate is sieved in 20mm size IS sieve. The sand borrowed from the market is also processed to remove unwanted materials such as small stone particles to make it suitable for concrete mixing.

The sand is also sieved which is passed through IS 25mm sieve and retained in IS 10mm sieve.

4). Preliminary test

a).The specific gravity of recycled coarse aggregate.
b). The specific gravity of normal coarse aggregate
c). The specific gravity of fine aggregate
d). The specific gravity of cement
e). Sieve analysis of recycled aggregate
f). Sieve analysis of coarse aggregate
g).Sieve analysis of fine aggregate.
h). Water absorption of recycled coarse aggregate
i).Water absorption of normal coarse aggregate.
j).Slump test.

IV. MATERIAL TESTING

Table 1: Sieve analysis of recycled coarse aggregates

size in mm	retained in gm (W2)	retained in gm (W3)	percentage retained	passing	are 383 for single size aggregates	are 383 for graded aggregates
40	0					
		766	38.3	61.7%	100	100
20	766					
		1972	98.6	1.4%	85-100	95-100
10	1206					
		1980	99	1%	0-20	25-55
4.75	8					
		1984	99.2	0.8%	0-5	0-10
Pan	4					

Result: Fineness modulus of given recycled aggregates sample is 3.351

Table 2: Sieve analysis of coarse aggregates

Sieve size	River Sand weight of Sample W1				Limits		
	Weight retained in gm	Cumulative weight retained in gm	Cumulative Percentage retained	Percentage passing	Zone 1	Zone 2	Zone 3
10mm	-	15	1.5	98.5	100	100	100
4.75 mm	15				90-100	90-100	90-100
		60	6	94			
2.36 mm	45				60-95	75-100	85-100
		210	21	79			
1.18 mm	150				30-70	55-90	75-100
		500	50	50			
600 micron	290				15-34	35-59	60-79
		950	95	5			
300 micron	450				5-20	8-30	12-40
		990	99	1			
150 micron	40				0-20	0-10	0-10
		1000	100	0			
Pan	10						

V. RESULTS AND DISCUSSIONS:

Theoretical/Model results

The outcomes obtained from the experimental observe have been analyzed using ANN in the mat lab. The various fashions have been developed by using considering output information of every variant as enter for the ANN version and the target turned into given because the actual value of compressive energy acquired from the crushing of concrete cubes. The prediction of compressive electricity has been made for character variations of enter statistics the usage of the ANN version. The 1 factor has been chosen to envision the 28 days concrete compressive strength. A Model has input data as the Replacement of recycled coarse aggregate in % and target data as compressive strength.

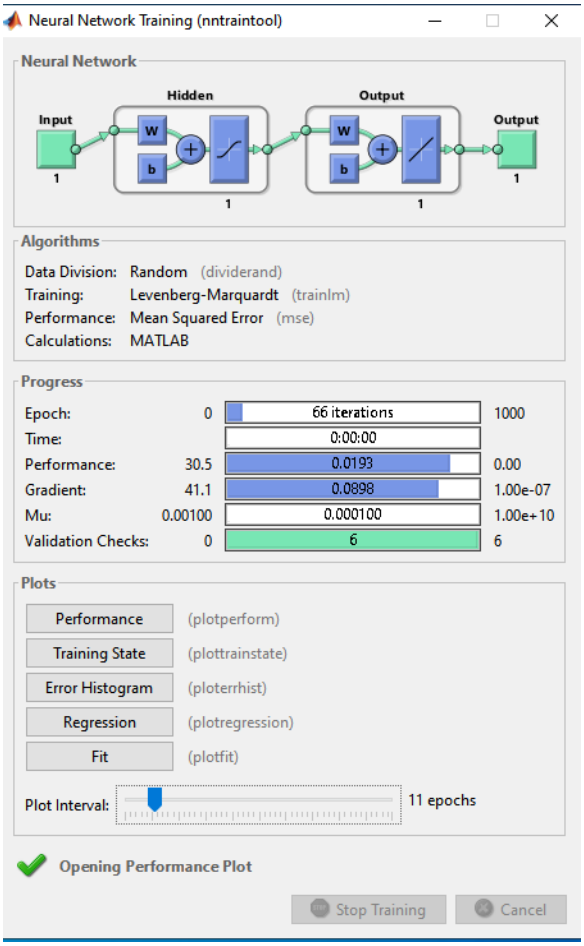


Figure 3 Neural network training

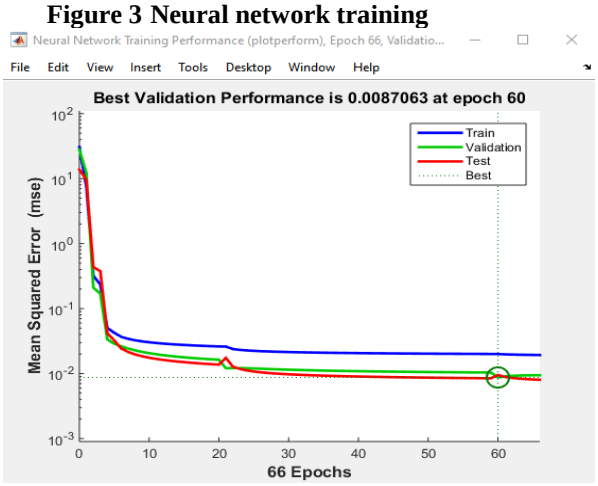


Figure 4 Best Validation Performance in Artificial Neural Network Model

The best quality validation acquired is 0.0087063 at epoch 60

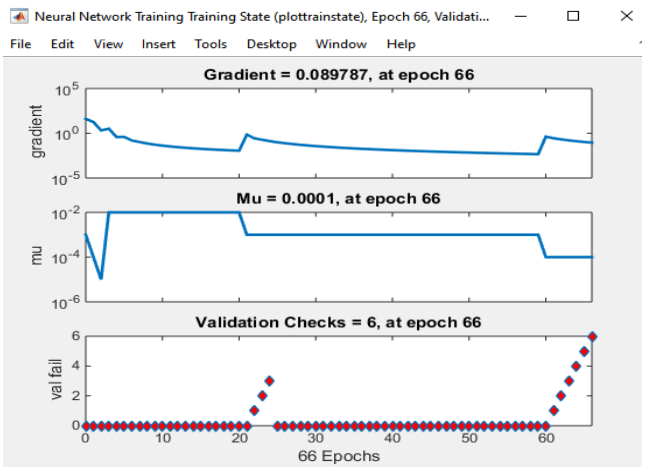


Figure 5 Training State for the Artificial Neural Network Model

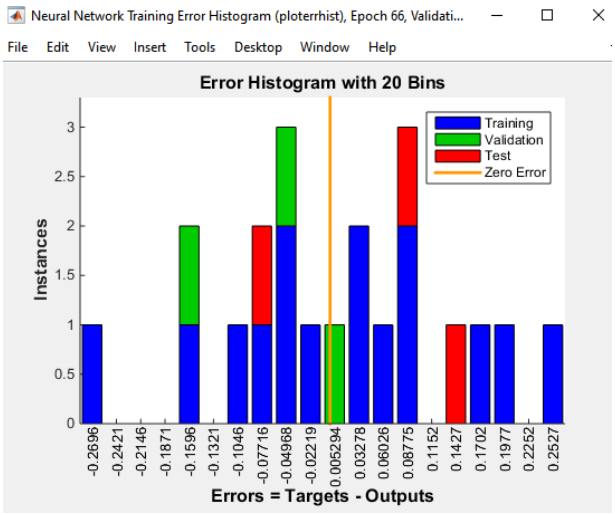


Figure 6 Error histogram for the Training, Validation, and Testing

The time period R (Regression) is obtained through Matlab software which demonstrates the version performance. Mean Squared blunders (MSE) is the average squared distinction among outputs and goals.

Lower values are higher. Regression R Values degree the correlation between outputs and targets. An R-price of one manner a close relationship, 0 a random dating. The MSE and R-value for training validation and testing are given in Table3 the general R-value for compressive strength is 0.99.

TABLE 3 SHOWING THE MSE AND R VALUES

	Samples	MSE	R
Training	15	2.00	0.98
Validation	3	8.7	0.99
Testing	3		0.99

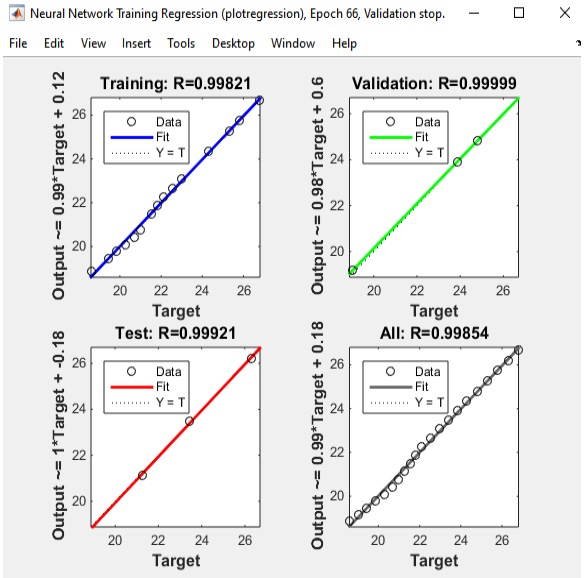


Figure 7 Training, validation and testing set in the ANN model

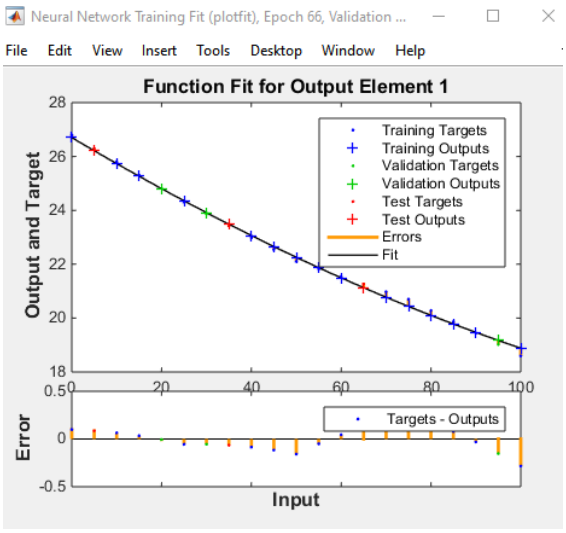
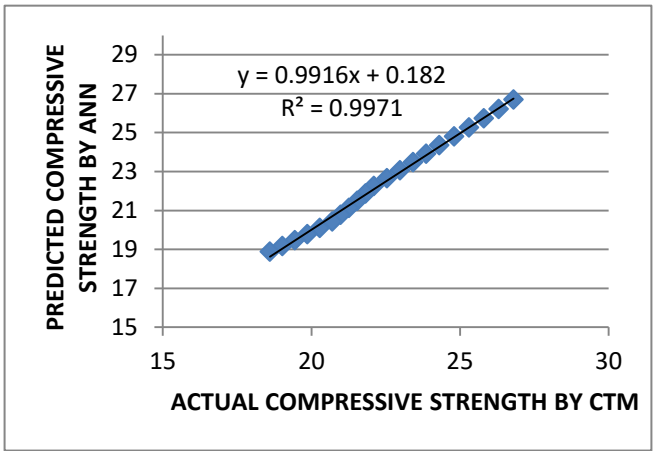


Figure 8 Function fit program for output element

Figures 8 illustrate the purposeful relation between the goal and output variables for training, and validation steps of output and target values, respectively. By characteristic healthy application for output detail. The goal values suggest the Measured Compressive strength and the Output values mean the expected Compressive strength by using Matlab software program. It in reality indicates the error distinction among take a look at outputs (i.E. Predicted compressive strength with the aid of ANN) and check target (i.E. Actual compressive electricity examined within the lab) values.

A graph is plotted between the model results and the experimental results and an equation is proposed to check the efficiency of the model and obtain the minimum value of the coefficient of multiple regressions R^2



The term R^2=0.997 implies the efficiency of the model. The linear relation is given by an equation y = 0.991x + 0.182. Here in this equation Y is the actual compressive strength and X is the predicted compressive strength. It was observed that the percentage error obtained through the actual and predicted values are less. Hence, the ANN is the best method for envision the compressive strength of concrete that can be used widely used.

VI. CONCLUSION

Here we conclude that the semi replacement of coarse aggregate in concrete at 75% normal and 25% recycled aggregate can be used for construction purposes instead of 100% normal aggregate, as they both are having nearly equal strengths in terms of Compression and Split tensile strength tests. Hence, this method is economical and it can also be helpful in recycling/reusing the waste materials from the demolition sites. The mean square error (MSE) value for 28 days compressive strength it is 6.7. The coefficient of correlation (R) obtained during the ANN modeling process is 0.986 for 28 days compressive strength during training, validation and testing process. Finally, based on the above observations, it can be concluded that the prepared model is efficient in the development of ANN model for 28 days compressive strength.

REFERENCES:

1. P Awoyera, R Gobinath, S Haripriya, New Light Weight Mortar for Structural Application: Assessment of Porosity, Strength and Morphology Properties, International Conference on Emerging Trends in Engineering (ICETE), 59-65
2. Awoyera P.O., Adesina A, Gobinath R, (2019), Role of recycling fine materials as filler for improving performance of concrete- a review, Australian Journal of Civil Engineering, Volume-17 Issue-2, Doi no. 10.1080/14488353.2019.1626692, Taylor and Francis Ltd, ISSN no. 14488353
3. Selvaraj Kumar P., Murthi P., Gobinath R., Awoyera P,(2018) Eco-friendly high strength concrete production using silica mineral waste as fine aggregate – an ecological approach, Volume-24 Issue-2, ISSN: 0971765X, EM International.
4. Poongodi K, Murthi, Gobinath R, (2019), Effect of mineral admixtures on early-age properties of high-performance concrete, IOP Conference Series: Materials Science and Engineering.
5. Murthi P., Poongodi K., Awoyera P.O., Gobinath R., Saravanan R,(2019) Enhancing the Strength Properties of High-Performance Concrete Using Ternary Blended Cement: OPC, Nano-Silica, Bagasse Ash, Doi no. 10.1007/s12633-019-00324-0, ISSN no. 1876990X
6. S Haripriya, G Alok,(2018), Study On The Mechanical Behaviour Of Concrete Upon Replacement by Silica Fume and Addition of Steel Fibers, ICRTEMMS Conference Proceedings 770 (774), 770-774.

7. G Alok, S Haripriya,(2018), A Study of Stress-Strain Behavior of Concrete Using Copper Slag as a Partial Replacement of Fine Aggregates, ICRTEMMS Conference Proceedings 7 (11), 7-11
8. SG Reddy, G Alok, S Haripriya, (2018), Index and Engineering Properties of Expansive Soil from Telangana Using Fly Ash, ICRTEMMS Conference Proceedings 48 (52), 48-52.
9. MD Ikramullah Khan, Bhavani Challa, S.Haripriya (2019), Sorptivity and Durability Assessment of Dolomite Impregnated Ternary Concrete, International Journal of Recent Technology and Engineering, ISSN: 2277-3878, Volume-8 Issue-2, July 2019.
10. E.Laxmi Prasanna,B.tipraj, S.Haripriya,(2019), Mechanical Properties of Fly Ash Based Concrete Aided With Recycled Aggregates and Manufactured Sand, International Journal of Recent Technology and Engineering, ISSN: 2277-3878, Volume-8 Issue-4, November 2019
11. GS Yadav, M Khan,(2018), A Study on Characteristics of Concrete Using Pond Ash as a Partial Replacement of Sand, ICRTEMMS Conference Proceedings 12 (15), 12-15.
12. Deshpande, N., Londhe, S., and Kulkarni, S. (2014). "Modeling Compressive Strength of Recycled Aggregate Concrete by Artificial Neural Network, Model Tree and Nonlinear Regression". International Journal of Sustainable Built Environment, Vol. 3, No. 2, pp. 187-198.
13. Nikoo, M., TorabianMoghadam, F., and Sadowski, Ł. (2015). "Prediction of Concrete Compressive Strength by Evolutionary Artificial Neural Networks". Advances in Materials Science and Engineering, 2015
14. Khademi, F., and Behfarnia, K., (2016). "Evaluation Of Concrete Compressive Strength Using Artificial Neural Network And Multiple Linear Regression Models". Iran University of Science & Technology, Vol. 6, No. 3, pp. 423432.
15. Poongodi K., Murthi P., Gobinath R, (2019), Mechanical properties of pavement quality concrete using recycled aggregate, International Journal of Innovative Technology and Exploring Engineering, Vol. 9, No. 1, Doi no. 10.35940/ijitee.A3898.119119

AUTHORS PROFILE

First Author
- **Sandela Haripriya** , Assistant professor, Department of Civil Engineering, Centre for Design, S R Engineering College, Warangal, haripriya_varma_s@srecwarangal.ac.in

Second Author
- **Boorla Rajesh**, Assistant professor, Department of Mechanical Engineering , S R Engineering College, Warangal,boorlarajeshmech@gmail.com

- **Dara Swetha Sudarshan**, Assistant professor, Department of Civil Engineering S R Engineering College, Warangal.swethasudarshan109@gmail.com

- **Md.Ikramullah khan**, Assistant professor, Department of Civil Engineering S R Engineering College, Warangal, md_ikramullahkhan@srecwarangal.ac.in

- **Bandi Bhaskar**, Assistant professor, Department of Computer Science and Engineering, S R Engineering College, Warangal,bandibaskar1526@gmail.com