

Self Cleaning and Maintaining of Road

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Abstract— The cleaning and maintenance of the street pavements is the necessity of the town and cities now a days. If the people stand with the current maintenance process, It will only widen and deepen the crisis. There any many harmful substances which affect human as well as environment and makes street nasty. It gives bad impact on the lower part of vehicles such as vehicles engines and plastic wastage can be causes of slip the vehicles, Which takes place of minor and major accidents. The durability of the pavement is broadly depend on the temperature variation. The change in temperature develops unwanted stresses in the pavement, Which leads to the crack formation. Removing and controlling of these type of problems is the challenging task. The process is to make clean the pavement by water and air pressure and prevention of road surface by temperature variation. In India mostly two types of roads are constructed bituminous and concrete roads. Bituminous roads are Cheap to construct compare to concrete roads. The load carrying capacity of Bituminous is less comparatively. There are potholes appears on bituminous road quickly because of various reasons. One of the major reasons for it is variation in temperature.

Keywords— Advance Cleaning System, Road Stud, Spraying Nozzles, Remedy for Cracks, Defect, Prevention of pavements, To Make India Clean.

I. INTRODUCTION

In India there are many Highways, Major states roads and other district road which is the main appearance of India but these streets are covered with filthy material and wastage. Which is spoiled the beauty of the highway and streets and these wastage not only effect the human heath but also effected the environment. Some time These materials causes of accident and spread many types of disease in the environment.

This types of problems mainly generate in high population cities such as Delhi, Mumbai, Hyderabad, Chennai, etc. Everyday peoples face this type of problems which is one the biggest problem of developing India. And the durability of the road in India is also poor and for this poor condition The

Ministry of Road Transport & Highway spent the amount of Rs.600 Cr. For road safety and cleaning purpose during the year 2015-2016 and 2016-2017, But this process is slow to reduce the problem, and temperature variation is also effect the road pavement which the reason of vehicle maintenance and failure of the vehicle part, It to be dangerous for the running vehicle on the road.

Maintenance of a road network involves a variety of operations, i.e., identification of deficiencies and planning, programming and scheduling for actual implementation in the field and monitoring. The essential objective should be to keep the road surface and appurtenances in good condition and to extend the life of the road assets to its design life. Broadly, the activities include identification of defects and the possible cause there off, determination of appropriate remedial measures; implement these in the field and monitoring of the results. This will involve several subsystems of identification, evaluation, planning, scheduling, management of men, material and machinery and then performance evaluation.

- a) To identify type and classification of common defects in flexible pavements.
- b) To identify the causes of these defects and suggest remedial measures.
- c) To identify the defects in existing pavement maintenance practices.
- d) To rectify the identified defects for smooth movement of traffic flow.

II. EFFECT OF WASTAGE AND TEMPERATURE VARIATION

Pavement cracking is the complex phenomena Pavement cracking is the complex phenomena that can caused by temperature variation and load of vehicle. At high temperatures the viscous component dominates and total stress relaxation takes few minutes.

- a) Longitudinal cracking, occurring generally in the wheel path.
- b) Transverse cracking, that can be in any lane.

Alligator and crocodile cracking, where longitudinal and transverse cracking get together and forming network of cracks.

A. Reflecting Cracking

The road surface initiated cracks generally the result of cyclic result of temperature. In thick asphalt pavements, these cyclic, diurnal and annual changes are primarily responsible for crack development. The temperature of the asphalt in summer exceed up to 50 degree C. The road temperature is normally 35 higher than the atmospheric temperature, This types of cracking is very dangerous for people and excessive loss of texture depth and rutting may affect vehicle steering and braking.



Fig. 1. Reflecting Cracking

This is mainly occur directly over the underlying cracks or joint.

B. Transverse Cracking

For Transverse cracks are cracks that are perpendicular to the roadway alignment. This is generally due to the temperature changes with shrinkage during the curing which causes tension in the concrete and concrete will expand and contract with temperature.



Fig. 2. Transverse Cracking

C. Alligator Cracking

The template Fatigue cracking is also known as alligator cracking or crocodile cracking, which is common type of distress in asphalt.



Fig. 3. Alligator Cracking

This types of problems generally occurs in concrete pavement which is divided into three part :

- i. Jointed plain concrete pavement (JPCP).
- ii. Jointed reinforce concrete pavement (JRCP).
- iii. Continuously reinforce concrete pavement (CRCP).

And the temperature also increase between the vehicles tyre. And not only temperature effect the pavement but also wastage give a bad impact on human health such as plastic bags, cans, bottles and harmful medicines gives a broad impact on humanity and this types of substances is very toxic and after some time it can be react with the atmospheric agents and release the harmful gases in environment. There are many city which is suffered by the different type of diseases and infection also such as,

- i. Skin and blood infection resulting from direct or indirect contact of waste and from infected wounds.
- ii. Eye and respiratory infections resulting from exposure to infected dust.



Fig. 4. Waste Spread on Road

III. METHODOLOGY

In advance cleaning and treatment of road pavement, First of all we collect the water in underground water collecting tank. So that the rain water which was only runoff and flows in the drainage was used in a proper work.

A main pipe set along the camber of the road which was directly connected to a underground water storage tank. Then connect the sub-main pipes to all studs with main pipe. A high intensity water pressure release by the pressure with the radium plates all sides which wash the road with water pressure and makes road clean.

Water flows from the studs it drain off to the drainage and collected into the filter chamber which is use after the filter process. In filter chamber we use the natural filter, which consists of coarse aggregates and fine aggregates. Then we reuse the filtered clean water.

The methodology is carried out in the following steps:

- a) Selection of site.
- b) Determining the stretch going to be designed.
- c) Allocating location for central main pipe.
- d) Design of discharge required.
- e) Design of central main pipe.
- f) Design of sprinklers.

IV. MATERIALS

As per the given procedure of the Project Material Collection is the main motto for the on-going process of project. Various materials are collected for the completion of the project is as follows:

- a) Materials for practical approach on site.
- b) Spray nozzle.

- c) Pipe.
- d) Pump.
- e) Street lights.
- f) Road guide light.

V. METHODS

Different countries have different weather conditions. In some regions there is heavy rainfall and snowfall whereas somewhere there is very slow and less quantity of rainfall. In India rainfall varies according to different region like in state of Rajasthan there is less amount of rainfall and in Maharashtra more quantity of rainfall occurs whereas in Jammu and Kashmir instead of rainfall amount of snow fall is more. According to the condition the shape of road is decided. In other countries like America, Japan, China the road which is constructed have flat surface because there is adequate rainfall occurs so there is no problem of drainage overflow occurs. But in India the rainfall data changes with times.

Sometimes there is too heavy rain whereas sometimes there is drought. So, when there are heavy rainfall drainage problems occurs. For the proper drain out of water the roads are constructed with slightly curved surface than the flat ones. The main cause of failure of road is cracks. Cracks of several types like hair cracks, Longitudinal cracks etc.

If the cracks are not treated properly then it goes wider and wider. This will lead to failure of road. One of the major reasons of cracks on road is the temperature change. In India the impact of seasons is vary from place to place. So, the cracks are major problem in India. In afternoon the temperature raises much and on other hand at night the temperature falls too much.

The problem occurs due to temperature changes can be avoided by spraying water on it. When the water is spread on the road, the temperature of the road is maintained.

In India in the metro cities like Surat, Ahmedabad, Delhi the roads are washed with clean water every day. So, why it need to wash the roads? There are many reasons for washing the roads. In this project why the roads are wash and how they are effectively washed is briefly discussed. In India, there are various special machineries like mechanical broom (approx. cost Rs.1.3 lakh/ piece), Road sweeper (approx. cost Rs.7 lakhs) etc. Various machines are available for road cleaning purpose with varying size and cost.

VI. PROCESS LAYOUT

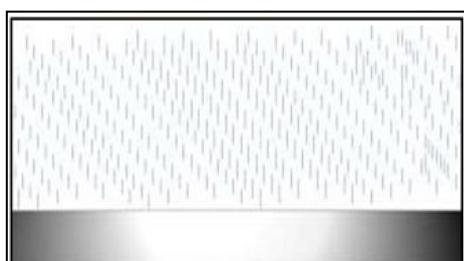


Fig. 5. Raining on the road

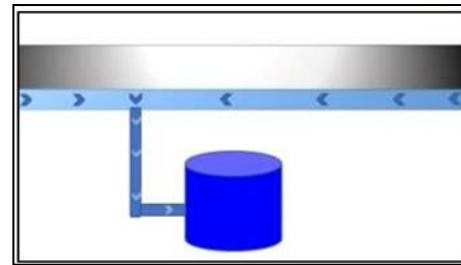


Fig. 6. Water Collecting in underground tank

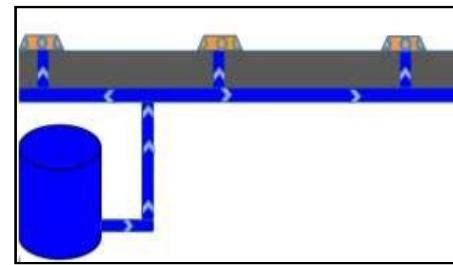


Fig. 7. Water goes to studs from tank

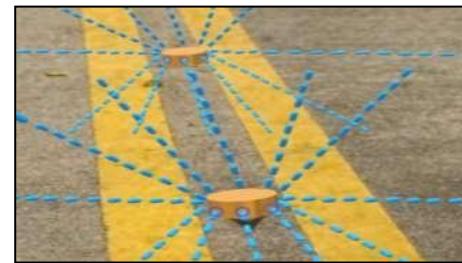


Fig. 8. Water flows from studs and clean the road

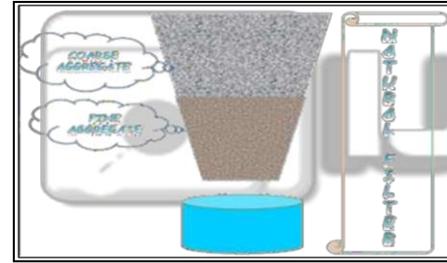


Fig. 9. Natural filtration Chamber

VII. ADVANTAGES AND DISADVANTAGES

A. Advantages

- i. Temperature of the road is maintained.
- ii. Cracks on the roads are avoided.
- iii. Dust from the road is reduced.
- iv. Aesthetic of the road is increased.
- v. Heavy machineries are avoided.

B. Disadvantages

- i. Construction cost of road is increased.
- ii. There may be danger if the heavy vehicles more than maximum design load are passed over it.
- iii. Periodically maintenance must be required.

VIII. EXPERIMENTAL RESULTS

There is section of automatic cleaning street, In the center of pavement a system of radium pales which spray the water and air in this process we can also use the rain water which is collected into the chamber.

It process also increase the cleaning area of the surface and the effective stress which is the cause of damage of the road pavements and there are many cracks develop from temperature variation which develops cracks on streets from this process the pavement temperature which is increase more than 50 degree C and get maintained by the water wash.



Fig.10. Self Cleaning Street Modal

According to this process we can also prevent the surface of road by temperature. Some advantages of this project mention below –

- a) It reduce the vehicle maintenance by remove the dust and junk which affect the lower part of vehicles.
- b) It maintain the pavement temperature, which is the cause of pavement cracking.
- c) It remove the toxic and waste material from road.
- d) It also help to make Indian clean and follow the SWACHA BHARAT ABHIYAN.
- e) It reduce the average rate of accidents by road wastage.

IX. CONCLUSIONS

After The above paper gives solution for road washing problems. This technique is used in South Korea, but this can also be used in India.

The above paper gives the detail description about all the advantages of this technique. Road washing is a good for its aesthetic and durability. So to maintain road washing works the road stud can be very useful at dividers preventing it from breaking from vehicles due to its advantages of using it.

The Automatic Cleaning and Treatment of road pavement process is capable to reduce the road cracking effect and it also helpful to clean the Roads, Highways which is the beauty of Indian.

And all substances which gives a harmful effect on environment and also human health, we can easily remove from the road surface and dumped safely and Automatic water wash and dry system gives a broad impact of cleaning and maintenance process of road.

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Any errors and omissions are unintentional and are sincerely regretted.

REFERENCES

- [1] Highway Engineering, "S.K. Khanna & C.E.G. Justo", Edition-200.
- [2] A manual of Guidelines of road drainage by Indian Road Congress "IRC-SP-42:2014".
- [3] Self-cleaning reflective road marker Patent US44113923.
- [4] IRC-106-1990 Guidelines for capacity of urban roads.
- [5] The effect of climate change o highway pavements and how to minimise them:technical report by T. Willway, L.Baldachin, S.Reeves, H.Hrding, M.Mchale, M.Nunn.
- [6] A course in Highway Engineering "S.P.Bindra".
- [7] 'Review Paper on Defects in Flexible Pavement and its Maintenance' International Journal of Advanced Research in Education & Technology (IJARET), Vol. 4, and Issue 2 (April - June 2017), ISSN: 2394-6814.
- [8]] 'Nozzle Wear Parameter in Water jet machining The Review' Saurabh Verma et. Al. IJEDR, Volume 2,Issue 1, ISSN: 2321-9939
- [9] IRC-SP-20 (February, 2002), Rural Roads Manual The Indian Road Congress, New delhi-110011, 2002.
- [10] USD244764 US patent by D. Swarovski & Co. titled 'Road-traffic stud'
- [11] IRC-106-1990 Guidelines for capacity of urban roads.
- [12] <https://dir.indiamart.com/nashik/sprinkler-irrigationsystem.html>