Review on road marking paint machine and material

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Abstract: Road marking plays important role is maintaining traffic and guiding drivers to drive vehicles in proper way. this paper summarizes the continuous analysis and research of road marking paint machine, road marking paint applicator and road marking paint materials. The paper includes review of advance technology used in detection of road marking and recognition of road marking as well. Various types of road marking materials such as retro-reflective thermoplastic paints, cold plastic paints, water based paints, glass on bead paints and primer. Different types of road marking paints have some similar and some different properties which can be used as per requirement of work.

1. Introduction

Safety of vehicles and people can be achieved through road marking. Road marking plays vital role for road safety specially on highways. In this era of competitiveness road marking paint industry also using high end technologies. Road marking is compulsory thing to illustrate proper roads and for avoiding possible accidents of road travelers. The ministry of road transport and highways and Bureau of Indian Standards regulates standards related to road and road marking paints materials by using this standards paints are formulated by using chemicals and minerals. Each material is checked in laboratory before using it in paints to confirms it's specifications and properties according to road marking paint requirements.

This paper reveals studies of thermoplastic paints that shows features like lofty period reflectivity with outstanding ivory. Other properties are abrasion resistant, quicker shrivel time, superior durability, and magnificent adhesion. These are paints which are easily implemented with screed and spray machine and they are non hazardous as well as non harmful for atmosphere. Paints with base solvents have properties like air passing that is it has good porosity and it has bright white color. It has unique property of resisting alkali on surfaces made up of concrete and it also has property of self cleaning with hydrophobic surface. These road marking paints have property of lesser skid and excellent flow.

1.1 Road Marking Paints :-

1.1.1 Retro-Reflective Thermoplastic Road Marking Paint

Thermoplastic Retro-reflective road marking paint :

One of the product of this road marking paint manufacturing machine manufactured is Shell Mark HT. Shell Mark HT has great colour balance and also don't get affected by changing weather. Shell Mark HT is thermoplastic material which is based on
petroleum resin. Mixture prepared from materials and glass beads used to make reflectivity for longer period of time. SHELLMARK HT is easy to melt and can be applied on both asphalt and concrete surface. Application of Shell Mark HT on concrete is also easy. It has excellent wear resistance to ensure long life of the marking. Life of marking is very long because it has low wearing ability.

- Characteristics:
  - Better durability
  - Friction Resistance
  - longer period of reflectivity with magnificent brightness
  - Quick shrivel & magnificent stickiness
  - Fine flow & slip aversion
  - Provides great aversion to changing weather &
  - colour balance

1.1.2 Cold Plastic Road Marking Paint:
Shell-Mark CT is different from thermoplastic road marking paint. It is made up of two different materials. The process of making cold plastic road marking paint is road marking without solvent and only just by curing cold. Shell-Mark CT is acrylic resin based paint. The paint is made up of specifications provided by standards bureau.

- Characteristics:
  - Great durability & higher reflectivity
  - Great adhesion on surface
  - Simple application by using screed and spray Machine

1.1.3 High Performance Waterborne Acrylic Road Marking Paint
Shell-Mark WR again one of the manufactured product from road marking manufacturing machine. Shell-Mark WR is a packed individually and shrivel quickly which makes itself all-rounder paint. Solvent is not used in Shell-Mark WR acrylic. It is solvent less road marking paint emulsion. It is also made up by using Indian Standards.

- Characteristics:
  - Hard surfaces like concrete and bituminous it has splendid wear properties.
  - Bitumen spill is impossible for this paint.
  - Superlative and detectable in low light or no light.
  - Simple application by using applying instrument like roller, brush etc.
  - Better stickiness and area of highly contrasted colours.

1.1.4 Fast Drying Solvent Based Road Marking Paint:
Shell-Mark SB is made up of only one component. It is massively used for making lines. It is very solid paint. It is different from other non solvent based paint, it is solvent based paint. It is also made up on the specifications prescribed by Indian bureau.

- Characteristics:
  - Sublime durability and very reflective
  - Better air passage and brightness
  - Resistive for alkali on concrete surfaces eminently.
  - Clean by itself property which is hydrophobic surface.

1.1.5 Primer for Thermoplastic Road Marking Paint for Concrete Surface:
Primers are usually used for coating on surface before the paints. It helps to maintain adhesion between the layer of paint to surface of concrete. Shell-Prime RM is also solvent based primer. Shell-Prime RM is manufactured in such way that road marking paint and other coatings can be applied successfully.

- **Characteristics :**
  - Simple application.
  - Helps to create binding between Shell-Mark HT and concrete surfaces.

### 1.1.6 Water Based Gloss Finish Kerb Marking Enamel:
It is environment friendly as it is based on a acrylic resin system. It is formulated for line marking on all outdoor traffic kerbs. Synthetic Enamel is a product which is manufactured for fast shrivelling. This enamel is water based and it has glossy finish. Acrylic based enamel have no hazardous effects on environment. This enamel can used for marking any busy road.

- **Characteristics :**
  - Weather Protective - This paint can sustain any weather like heavy rains and extremely hot sunlights which makes this product highly recommendable.
  - Proper Utilized shrivelling duration - Shrivelling time is minimize with constraints so that finishing between each coatings are smooth.
  - Simple application - No complex process

### 1.1.7 Drop on Glass Beads for Road Marking Paint:
Road marking paint can be reflective for longer period of time just by using glass bead. This helps to locate proper direction on the road in day time as well as in night also. This glass bead can withstand in any weather conditions. Glass bead can be used with all road marking materials for reflections. These are Class B Drop-on glass beads. B class glass beads are manufactured which helps to penetrate surface as much required.

- **Characteristics :**
  - Water molecules cannot affect this glass bead.
  - Smooth flowing
  - Splendid adhesion on road markings.
  - Sublime reflectivity with longer period of time.
  - Application on roads, airports, sea ports, parking lots
  - Used in parking lots, airports, highways, roads, seaports etc.

### 2. Review Of Papers
2.1 “Coagulation efficacy of a tanin coagulant agent compared to metal salts for paint manufacturing wastewater treatment.” M. A. Aboulhassan, S. Souabi, A. Yaacoubi, M. Baudu

Research shows that the comparison between metal salts which are use for paint manufacturing and tanin coagulant's coagulation efficacy. Human health is highly affected by hazardous wastes excretes from industry. Paint manufacturing industries wastes also contain high amount of toxic water. Laboratory experiments are conducted to test PMW (Paint Manufacturing wastewater). While experimenting many elements are considered such as iron chloride, tanin based polymer and aluminium sulphate. Results reveals that TBP (Tanin based Polymer) is more efficient than other coagulant salts. In the conclusion, TBP is better than synthetic product for paint manufacturing is obtained.
2.2 “Reading the road : Road marking Classification and interpretation.” Bonolo Mathibela, Paul Newman, Ingmar Posner
Author evaluate the road marking system for automated vehicle. Aim of this paper is to compare different types of condition and stages for automated vehicle to understand road marking pattern. Road marking interpretation can be easily understood by manual drivers but difficult for the automated vehicle. However road marking recognition can be done by using convolutional neural network classifier. Road marking interpretation by using automated vehicles faces some difficulties which is highlighted by using boxed junction, zigzag form, intersection form, single boundary form and special lane. Probability of getting Rusboost and conditional random field geometric functions to detect road marking is based on this classification framework. It is concluded that the work is done on larger perspective including many real world examples.

2.3 “Road Marking Recognition with computer vision system.” Konstanitin V Ignatiev, Elena V Serykh, Anna V Mironuik
In this paper researchers implement robot for road marking recognition. Aim of this research is to use computer vision technology to road marking recognition. Model created by researchers have automated motion which helps it to move freely in public. Mobile robot have four wheels. Control system of mobile robot road marking is to design dashed lines on the roads, roads edges, different light conditions. GPS and other vision devices are used for locating robot. Mobile robot have car like structure. As a test, robot moves with open computer vision library and motion control according to obtained information. Robot is practiced on ground with road markings. It concludes that it is low power consuming device so it can be use single board computer raspberry pi 2.

2.4 “Influence of volatile organic compounds emissions form road marking paints on ground level ozone formaation : Case study of Krakow Poland” Tomasz E Burghardt, Anton Pashkevich, Lidia Zakowska
Author stated that, ground level ozone is known in the entire world for its mail pollutants which is reason behind smog and many atmosphere pollution. When this pollutants reacts with nitrogen oxides this forms ozone which is harmful for atmosphere. Wastewater and waste gases emitting from road marking paint manufacturing plants are hazardous for environment and human health. Volatile organic compound is reacted with nitrogen oxide which affects ozone formation. Aim of this work is to test different aromatic solvent for lesser harmful effect. Results shows that, removing of the aromatic solvents is not helping to minimize the emission of volatile organic compound, on the other hand it decreases the production of ozone by half. It concluded that, waterborne paints with optimize choice of glass beads leads to selection of more sustainable option as compare to solventbased materials.

2.5 “One stage detection network with an auxillary classifier for Real Time Road marks detection.” Gyan Ting Lin, Patrisia Sherryl Santos, Che Tsung Lin, Chia Chi Tsai, Jiun In Guo
In this paper authors states that they developed road mark detector. Aim of this paper is to examine road mark detector in real world application. As a methodology for getting
good processing performance 32 frame per second nvidia Titan model GPU is used. Convolutional neural network is used for classifier. Road mark detector can easily detect multiple objects in single run. Additionally it can measures accurately which makes it's performance better. Extra convolutional neural network classifier is attached in the backside of system to avoid mispositioning and escalate accuracy. In the conclusion, the detector cover eighty six percent of map. Maximum portion is covered by detector so that it is beneficial and more upgrades in area covering can be possible in future upgradation.

2.6 “Generating all roads to Rome : Road layout and randomization for improved road marking segmentation.” Tom Bruls, Horia Porav, Lars Kunze, Paul Newman
Road marking is essential to solve problems of traffic. It tends to safe driving behavior from the vehicle and vehicle driver. Aim of this research is to find and implement road marking for automated vehicle. Road marking for automated vehicle requires vast networking and data. Providing such road marking networks is costly and time consuming. Data present on softwares are somewhat different and not acceptable to real world. Data of virtual world may have lack of information while implementing. Therefore, author experimented with principle of randomization. Many pictures and training algorithms are generated while training. This road marking database can work more efficiently than any other manual system. Locations with more traffic may require more pair of data sets. This system can work with high efficiency in heavily traffic areas also. It concludes that, with minimum manual labelling effort this can work.

2.7 “Performance of thermoplastic road marking material.” S Naidoo, W J vd M Steyn
This paper shows that, road marking paints must have some important characteristics. Aim of research is to evaluate results from different road marking paints on asphalt road surfaces. Retroreflective is main characteristics of road marking paint. Night time visibility also plays vital role while evaluating paint caliber. Day time visibility, resistive to skid and colour these three parameter which may affect decision of choosing suitable paint. Luminance and retroreflectivity of white and yellow road marking paint is checked by using different methods. Results shows that retroreflectivity can last long for one month to forty-eight months and luminance can last long up to one month to thirty months. If road marking paint is washed then there is no affect on retroreflective property but it enhances the luminance property. White road marking complied with colour specifications while there is no colour specifications for yellow road marking paint.

2.8 “Symbolic Road marking recognition using convolutional neural networks.” Touqeer Ahmad, David Ilstrup, Ebrahim Emami, George Bebis
Researchers investigates the convolutional neural networks usage for road markings symbols. Road marking recognition and detection both are different from each other. Road marking recognition conventional method is by using obedient feature extraction followed by obvious training. This method of road marking recognition is not usually effective. Another method of road marking recognition is by using template matching which is also old and ineffective and inefficient. This paper concentrate only on road marking recognition not on road marking detection. Convolutional neural network have successfully runs ADAS system which makes it suitable for road marking recognition.
For experiment five different models are prepared. All five models are trained with unique convolutional neural network architecture. Each model contains different numbers of convolutional neural network connected layers and unique resolution of road markings. Data used for research is taken from publicly available data set. Resulting different recognition percentage for all five models. Most suitable data set model recognized ninety nine point zero five percentile of road markings. It concludes that symbolic road marking recognition using convolutional neural network is beneficial.

2.9 “Performance of a combined system of biotrickling filter and photocatalytic reactor in treating waste gases from a paint manufacturing plant.” Peiyuan Zeng, Jianjun Li, Dongqi Liao, Xiang Tu, Melying Xu, Guoping Sun
This research suggest that biotrickling filter is combined with photocatalytic reactor. Biotrickling filter is already used in industries to treatment of waste gases. Gases emitting from paint manufacturing plant is hazardous for human health and harmful for nature too. Volatile organic compounds like ketones and esters are used for paint manufacturing process. This compounds may affect atmosphere. Removal efficiencies of biotrickling filter is ninety five percent on eightieth day. Biotrickling filter needs eighty days to accept aromatic compound. Removal of aromatic compounds from biotrickling filter was difficult. Due to some elements of waste gases it is not possible to achieve maximum efficiency of removal of dirt by using biotrickling filter. When bootlicking filter is combined with photocatalytic reactor then removal efficiency increased dramatically. It results ninety nine percent of removal efficiencies when biotrickling filter used with photocatalytic reactor. It concludes that it is beneficial to use both reactor and filter simultaneously for treatment of paint manufacturing waste gases.

3. Conclusion:- Road marking paint machine, road marking paint applicator, road marking paint material are successfully studied through various papers. Advance technologies are also mentioned in papers which can be easily implemented in future easily. Road marking paints are selected on the basis of requirement of work.

4. Reference

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