

Mini Fire Brigade Vehicle

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Abstract

Fire disaster is a common threat to lives and property. The recent occurrence rate of fire in the slum area is about 24% of total fire incident. A Mini Fire Brigade Vehicle provides a real time control of class C, class D, class K fire. This paper provides a modified system at low cost, robust and secure fire protection system for the slum, rural area where fire brigade department are placed far away from the fire disaster place. As per a recent analysis by the Standing Fire and Advisory Council (SFAC), the overall deficiency in the country in terms of number of Fire Stations is 97.54%, in terms of fire fighting and rescue vehicles is 80.04% and in terms of fire personnel is 96.28%, respectively, which is quite alarming (NDMA Guideline, 2012, CR SFAC, 2011), which makes to think to improve fire protection in India and this system will have direct effect on numerical percentages regarding to it.[1]

1. Introduction

The population of India around 125Cr. And goes on increasing. Large percentage of this population is at the rural and slum area. The common threat is fire disaster in the slum and rural area. And the infrastructure of these areas are very compact and close to each other. So main task in front of the fire brigade department is to enter in this area because the width and height fire brigade vehicles are not compatible for entering in the small and compact lane(space between homes). So to reach quickly at the disaster location and tackle the fire in minimum time with this vehicle.

A mini fire brigade vehicle is one that has a fire extinguisher system that able to control small scale fire by saving a "golden time" to reach at the disaster place which avoid massive destructions of infrastructure and loss of life. This paper explores a modification and construction of the system able to tackle a fire equipped with piston pump, water tank (160 lit.) which can be refuel at the disaster place very quickly, CO₂ tanks, first aid box, and necessary mountings.

Most attraction for this system is the cost of the system is about 1/5 times less than existing fire fighting two wheeler. The capacity of the working bikes in the department is about only for the 1.5 min which is not sufficient for class C, class D and class K so improving with this capacity it will increase about 15 times. The refuel property for tanks will also increase this capacity depending on the availability of the water on the disaster place. The bikes use for extinguish the fire used a compress gas cylinder filled with water so dispersed area for the system is only in few feet. With this project bike this dispersed area is increases up to 15-20 meter with the use of the piston pump having a discharge of 24 lit per minute. As the pump is need to be installed on the bike so it required a power to drive and this is achieved by using power of engine by extraction a shaft without affecting the running performance of bike.

Block Diagram for system:-

- **Chemical power of fuel**
 - Act as the driver for engine
- **Engine Power**
 - Act as the driver for the piston pump
- **Piston Pump**
 - Use for the throw the water and surfactant

System Diagram:-

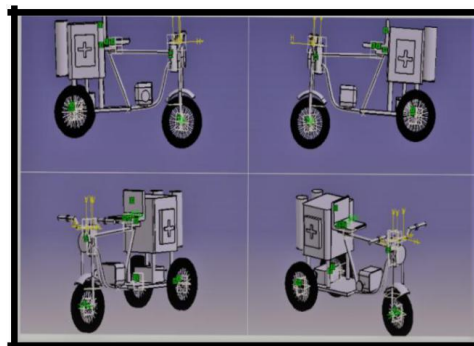


Figure 1 Descriptive basic system in CATIA

System Description:-

Figure 1 shows the structure of the proposed for mini fire brigade vehicle system for the prevention of the stating up fire in a slum and rural area. The driving mechanism for pump is received from the modified engine shaft which is extracted from the crankshaft of engine. RPM required for piston pump is 1200 RPM which will be obtained from the normal accelerated engine in neutral gear. The bike used for this system is RAJDOOT 175cc 2002 model 2nd. Shaft from the engine with mounted pulley is as shown in fig.2



figure 2 driving shaft for piston pump.

Next important component have in this system is mounting of the piston pump. For mounting of the piston pump a bracket is welded as per the outer dimensions of the pump. The belt use for the power and RPM transmitting is a V-belt of OLEOSTATIC A 52. The distance from the driving shaft is adjusted by the sliding bracket. When bike is in the running condition belt is remove from the pulley and it but when it reaches on the disaster place it should be loaded as fast as soon so golden time for avoiding a massive destruction and saving a lives is save, for this a sliding bracket is very helpful. While loading the belt following precautions should be take [2]:-

1. Check the alignment of the drive pulley;
2. Make sure that flanks of the grooves should be clean;
3. Adjust the tensioner to stretch the belt sufficiently;
4. Check the tension;
5. Protect the belt from the oil and other chemicals;
6. When installing belts, slack off tensioner and avoid using tools or implements which may damage the belts.



figure 3 pump mount on the bike

Tanks used for a storage of a water in proposed system is about 160 lit. And is divided in to two compartment for both sides so balancing is achieved effectively. Tank of surfactant is of 10 lit is also added to it. Generally a surfactant is a chemical compound that will reduce surface tension of the water so water can cover maximum area as possible as.



The ideal surfactant should be such that it will not help for lighting the fire. It should be completely miscible (soluble) with water so that during the discharging a water from the pump it will not offering any resistance. Firefighting foam is a foam used for fire suppression widely used in the aero plane accidents and for extinguish fire in the chemicals and cars. Its role is to cool the fire and to coat the fuel, preventing its contact with oxygen, resulting in suppression of the combustion. Aqueous film forming foams (AFFF) are water-based and frequently contain hydrocarbon-based surfactant such as Sodium alkyl sulfate, and fluorosurfactant, such as fluorotelomers, perfluorooctanoic acid (PFOA), or perfluorooctanesulfonic acid (PFOS).

Response Time Analysis:-

Reviewed the international best practices for fire service response time in developed countries with respect to the majority type of construction in those countries. RMSI used the existing fire station locations and conducted a network analysis to estimate the achievable response times with existing fire stations. Basis the global response time and network analysis, RMSI experts recommended 5 – 7 minutes in urban areas and 20 minutes in rural areas as the revised achievable response time for fire services in India. This activity helped in determining ideal jurisdiction areas for each existing fire station and identification of additional (5,572) fire stations to meet the response time criteria. The norms also defined one Fire Station in an area of 10 sq. km in urban area; and 50 sq. km in rural area. [1]

Mountings Along with Vehicles:-

- CO₂ Tank,
- Fire Axe
- First Aid Box,
- Hand Gloves,
- Pipe Hoses

Mini fire brigade vehicle:-

The complete assembly of the fire brigade vehicle is as shown follow



figure 5 mini fire brigade vehicle

The pipe which is connected to the piston with the hoses is of length 20 ft. by which water is throw up to 20ft. at normal steady acceleration condition which is further increases up to 30 ft. by accelerating the engine. The water last for 33 min for full capacity of tank but by the refueling of the water in the tank time is increases as per availability of the water. Vehicle also mounted with all emergency lights, a fire brigade siren and other thinks to give an emergency side and alertness.

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- [3]. FIRE EXTINGUISHING ROBOTIC VEHICLE, Anij Joseph John, Ashik K, Avinash Vishnu KS, Fahmi P, Henna P, ISSN 2229-5518

