

# STUDY ON POTHOLE FILLING METHODS AND TRUCKS

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## Abstract

In 2016, nearly 1,50,000 deaths were caused by road accidents in India. Out of these, 2,424 deaths in road accidents were caused by potholes. Apart from deaths, they cause several accidents leading to major and minor injuries, and delay in travel time. Pothole is a failure in an asphalt pavement when there is water present in the underlying soil which weakens the supporting soil, and then traffic around affected area fatigues and breaks the asphalt surface. In this paper, methods which are used for filling potholes are discussed along with a concept of a modified pothole filling truck. This truck is equipped with a roller at its rear, and consists mixing blades for the aggregate and emulsified asphalt.

**Keywords:** Pothole, Throw-and-roll method, Spray injection method, and Pothole filler trucks.

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## 1. INTRODUCTION

In India, on an average, 7 people die everyday due to accidents related to potholes. Due to poor drainage system around roads, and use of poor quality materials for road constructions, introduction of potholes in Indian roads is very common. This structural failure is generated due to presence of water below the supporting structure of the road and then exacerbated by heavy traffic near the weakened zone, resulting in formation of a pothole. Figure 1 shows a dry pothole on an Indian road.



Fig -1 Pothole on an Indian road

Potholes are surrounded by cracks; these cracks are called crocodile cracks. This is the initial stage of asphalt pavement failure. Crocodile cracks are shown in Figure 2. These cracks, when subjected to heavy loads, tear apart and create a small hole. This hole becomes larger and larger with heavy traffic and stops growing until the whole water-weakened region is turned into a pothole.



Fig -2: Crocodile cracks

There are several methods used for repairing potholes. Nowadays, the most common method is the pothole filling truck. This truck is equipped with a roller at its rear end and a hole in its base, which supplies the asphalt-aggregate mixture for filling the pothole. Figure 3 shows the sketch of a pothole filling truck.

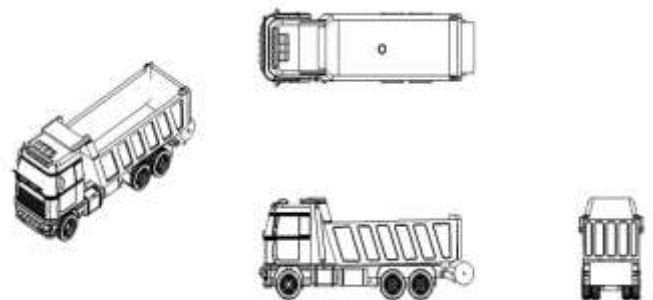


Fig -3: Sketch of a pothole filling truck

There are generally two types of patch mixtures used for pothole filling: hot and cold. Cold mixture is used when the traffic cannot be halted. It takes around 3 minutes for the cold mixture to set. On the other hand, hot mixture requires some time to set. Use of hot or cold mixture depends upon the cost and the level of traffic. Hot mixture is cheaper in cost than the cold mixture, and cold mixture provides a ready-to-go, durable, and effective repair than the hot mixture. Some other methods involving trucks in pothole filling are discussed below.

### 1.1 Throw-and-Roll Repair Method

Throw-and-roll method is one of the oldest and simplest pothole repairing method. It is a temporary repair and done where the conditions are unfavorable: wintry or watery conditions. It can be performed on wet potholes but has a better repairing effect when done on dry potholes. It is used very commonly in India because of its speed and simplicity.



**Fig -4:** Throw-and-roll repair method

Hot or cold patch material is placed in the pothole, and then the patch is compacted with a roller. Throw-and-roll method is cost effective and quick but it doesn't provide a long-lasting repair. Figure 4 shows throw-and-roll repair method.

### 1.2 Spray-Injection Repair Method

Spray-injection repair is a semi-permanent repair. It uses a spray gun to fill potholes. It is one of the best methods to repair a pothole. Figure 5 shows a spray-injection truck.



**Fig -5:** Spray-injection truck

First, water and debris are removed with a blower, then a tack coat of binder is sprayed on the sides and bottom of the pothole. Pothole is then filled with a mixture of asphalt and aggregate, and finally a layer of aggregate is used to cover the patch.

There are other semi-permanent repair methods, which use vibratory plate compactor, and the difference between spray-injection and other methods is in the other methods straightening of edges is done before filling the pothole with patch.

## 2. MODIFIED POTHOLE FILLER TRUCK

On Indian roads, conventional pothole filler trucks can be made efficient by making few modifications in the trucks. Figure 6 shows a model of a modified pothole filling truck. Apart from a hole in its base and a roller at its rear, two mixer blades are added and can provide a good quality mixture of asphalt and aggregate.



**Fig -6:** Modified pothole filling truck

Pothole filling truck works on the throw-and-roll method. The only difference: manual throwing of patch material is replaced by filling the pothole with a truck directly, by the hole provided in its base. It can also be automated by using ultrasonic sensors to detect the irregularities on the surface of the road, and of those irregular surfaces, the ones with

high difference with mean level of the road can be detected and filled automatically. The quantity of the patch material can also be governed with the help of sensors.



**Fig -7:** Cross-section of the modified truck

Cross-section of the modified pothole filling truck is shown in Figure 7. It shows a sloped base which will eradicate the problem of material accumulation at the corners of the truck. Figure 8 shows modified pothole filling truck with mixers. These mixers are provided to give a consistent mix. They are inclined to the plane, parallel to the surface of the road; therefore, helping the downward movement of patch material near the hole, with the help of gravity provided by the sloped base of the truck.



**Fig -8:** Modified pothole filling truck with mixer

These mixers can be operated using electric motors, and proper gearing system should be provided to increase its life. This arrangement has high initial cost, but after installation it can work as both: a mixer and a pothole filler truck. Patch mixture of emulsified asphalt and aggregate can be prepared on the same truck and only one driver is required to drive the truck and fill the potholes; hence, reducing the traffic on the road at the time of repair and cutting the labor cost.



**Fig -9:** Top view of the modified pothole filling truck

### 3. CONCLUSION

Modified pothole filling trucks are better than ordinary pothole filling trucks when they are compared, in reference to Indian conditions. They can work well for both hot and cold mixtures. A pothole filling truck can easily be converted into a mixer-cum-pothole filling truck by just adding mixing blades and by providing slope to the base of the truck. An additional motor is required to rotate the mixing blades. A better-quality mixture of emulsified asphalt and aggregate from the modified pothole filling truck will result in cost-effective yet stronger repairing material for the pothole filling.

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## BIOGRAPHIES



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