RTCEBE

Investigation on Settlement With Different Percentages Repomix-B as Pothole Patching Material

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Abstract: Potholes are the most common problem with bitumen pavement. They need to be fixed right away to keep the pavement from getting worse and to cut down on the chances of accidents. This study explored five available cold mix bitumen products worked against the settlement compare to one hot mix bitumen. Eighteen types of patching materials that is nominated as sample A1, A2, A3, B1, B2, B3, C1, C2, C3, D1, D2, D3, E1, E2, E3, F1, F2 and F3 were used at Taman Parit Raja. Sample A is using REPOMIX base, sample B is using Hot Mix Bitumen base, sample C is using REPOMIX-B with 10% bentonite base, sample D is using REPOMIX-B with 20% bentonite base, sample E is using REPOMIX-B with 30% bentonite base and sample F is using REPOMIX-B with 40% bentonite base. This research used levelling as a method to collect the data. The result from the levelling indicates that the settlement for all samples. REPOMIX-B with 40% of bentonite sample 3 is the finest against the settlement because the value of settlement is-0.001 and this sample reached the constant graph the earliest at 1050 passes. As a result, REPOMIX-B with 40% is the finest cold mix material for patching and maintenance work.

Keywords: Pothole, Settlement, Repomix

1. Introduction

A statistic shows that 11.2% deaths are caused from pothole [1]. Potholes are holes in the pavement that vary in size and shape [1]. A lot of things can cause potholes to form, but the main one is when water that is under the pavement of the road is drained. Here, bentonite is chemical substance that is water proof. The next problem is patching materials always facing problem with the settlement. Furthermore, patching material will always come loose and easy to defective. That's why it's important to know how to choose pothole patching materials and how to do it right [3]. This will cause a lot of maintenance cost to repair the potholes. This study will use REPOMIX-B that is form from cold mix asphalt. Emulsions are sometimes utilized when exceptionally stable emulsions are necessary,

particularly for cold mixtures with considerable amounts of particles [2]. Aim of using this material is to facilitate the maintenance and durable. The cold asphalt mix is flexible and functional for potholes [4]. While the behavior of hot mix asphalt is somewhat well known and knowledgeable about their performance is comprehensive, its failure to produce and store hot mix asphalt as needed in limited volumes makes it unfit for potholes and other localized repairs [5].

2. Materials and Methods

This research investigation will be conducted with levelling experimental when collecting the data against the settlement. This research will conduct on-site study and collect data to conclude the findings. This research design is an action plan which explains in detail how a study has been carried out [6].

2.1 Materials

The main material for this pothole patching is bentonite as shown in Figure 1. In theory, bentonite is water proof chemical materials, it will leads to a good result at the end. Pothole repair on porous pavements requires that the patching mixture have enough air voids, high strength, low moisture susceptibility, and high abrasion resistance to fill in the holes. Then, choosing aggregate grading plays an important part in the performance of bituminous patches [7]. In this study, a cold patch asphalt mix for pavements with holes was made. An open grading is desired for optimal combination workability, whereas the denser grading is required when the mix is put in a pothole to improve its durability [8]. An open graded mix gives enough room for thick binder films which contribute to the working ability and water resistance [9]. The bentonite was used as a mineral filler to make the asphalt and aggregates stick together better. This is how it worked. The bentonite material will help the pothole to stay last longer.
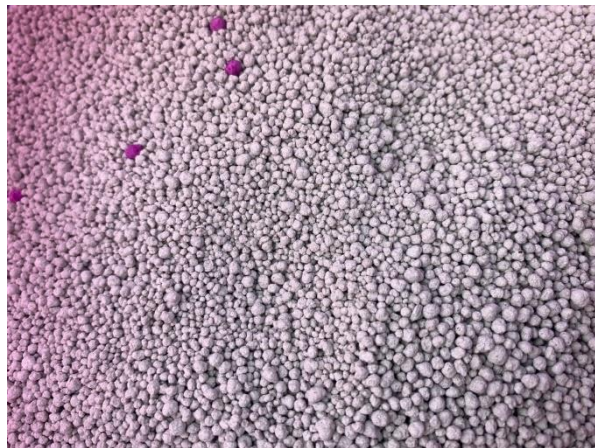
Figure 1: Bentonite materials

2.2   Samples

Below as shown in Table 1, the example of sample in this research. It is include the name of the sample, name and code for each sample. There are total eighteen samples in this research.

Table 1: Example of sample

No	Name of Sample	Name	Code
1	Controlled data 1	Hot Mix Asphalt	C-1
2	Controlled data 2	Hot Mix Asphalt	C-2
3	Controlled data 3	Hot Mix Asphalt	C-3
4	Sample 1	Repomix	R-5.5-S1
5	Sample 2	Repomix	R-5.5-S2
6	Sample 3	Repomix	R-5.5-S3
7	Sample 1	Repomix-B (10%)	RB-10B-5.5-S1
8	Sample 2	Repomix-B (10%)	RB-10B-5.5-S2
9	Sample 3	Repomix-B (10%)	RB-10b-5.5-S3
10	Sample 1	Repomix-B (20%)	RB-20B-5.5-S1
11	Sample 2	Repomix-B (20%)	RB-20B-5.5-S2
12	Sample 3	Repomix-B (20%)	RB-20B-5.5-S3
13	Sample 1	Repomix-B (30%)	RB-30B-5.5-S1
14	Sample 2	Repomix-B (30%)	RB-30B-5.5-S2
15	Sample 3	Repomix-B (30%)	RB-30B-5.5-S3
16	Sample 1	Repomix-B (40%)	RB-40b-5.5-S1
17	Sample 2	Repomix-B (40%)	RB-40b-5.5-S2
18	Sample 3	Repomix-B (40%)	RB-40b-5.5-S3

2.3 Methods

There were total of 18 pothole in this research. All of the pothole is divided into 6 types. First is the controlled data. Second is Repomix. Third is Repomix-B with 10% of bentonite. For the next sample is Repomix-B with 20% of bentonite. Then, fifth sample is Repomix-B with 30% of bentonite and for the last sample is Repomix-B with 40% of bentonite. Each sample will be prepared in 3 samples. To mix the bentonite with the Repomix, is using the ratio 10:1. As example, 10 cup of Repomix equal to 1 cup of bentonite. Then, it will be Repomix-B with 10 percent of bentonite.

This research was conducted to study the effectiveness of REPOMIX-B as pothole patching material against the settlement. From this study, REPOMIX-B will be used to determine the effectiveness against the settlement as pothole patching material. This study is important to decide

whether REPOMIX-B will be commercially use or not as effective patching material especially when loading is applied on the pavement

The method that used to collect the data was using the surveying. The method surveying that used in this research was levelling. Levelling is a datum is used to figure out the heights of points in relation to other points that have been given. The goal is to set up points that are either at certain heights or at different heights with respect to a given or assumed datum. Using levelling, the value of the settlement and the difference of the settlement can be determined. Each day, a vehicle will applied load on the samples which 50 passes a day.

For the process of patching the pothole, first step is swiping the pothole away from the dust or particles in the pothole. Second, measure the pothole and measure the length and the depth of pothole. Next is make sure that the pothole is in dry condition. Furthermore, spread all the REPOMIX-B into the pothole and then make sure the pothole is filled fully and compacted. Lastly, repeat the step above at different location of potholes.

3. Results and Discussion

After the fieldwork is done, the data has been processed. This research investigation was conducted with levelling experimental when collecting the data against the settlement [6]. Results were talked about in terms of the different heights of settlement. The survey method was used to get the data.

3.1 Grid point samples

Leveling work was done with the help of a gridline to get the height of each intersection point that had been marked on the site location. Because the temporary benchmark is thought to be worth 100.00, it was done. The highest value for that was found during levelling work at site location was 85.30, while the lowest value was 83.00. This is shown in Figure 2.
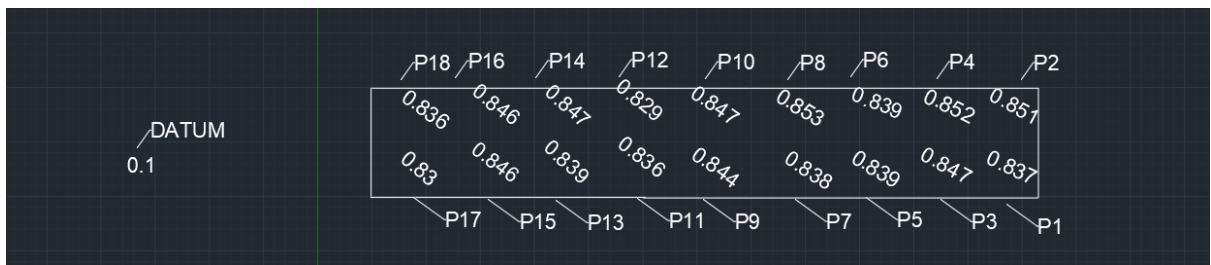

Figure 2: Value of the grid point

According to the grid point, point 8 has the highest value of levelling. This data was measured daily passes against the different height of the settlement. Sample for point 8 is Repomix-B with 10% of bentonite. While point 17 has the lowest value of levelling. Sample for point 17 is Repomix-B with 40% of bentonite. Means that, Repomix-B is the best sample against the settlement.

3.2   Data discussions

3.2.1   Settlement against daily passes

For before and after loading, this data was measure settlement against daily passes (cumulative).
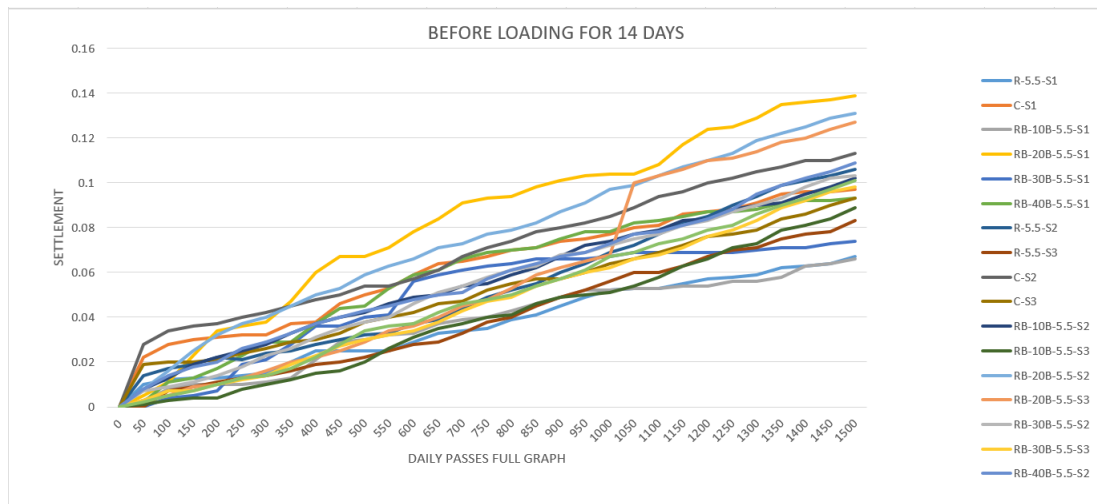
Figure 3: Full graph for 15 days (before)

For full graph for 15 days before the loading as shown in figure 3, Repomix-B with 20% of bentonite sample 1 has the highest value of cumulative settlement at 1500 passes which is 0.139mm. Then, for the lowest is all the same because there is no loading at the beginning. The trend for this full graph before loading for all samples are increasing.
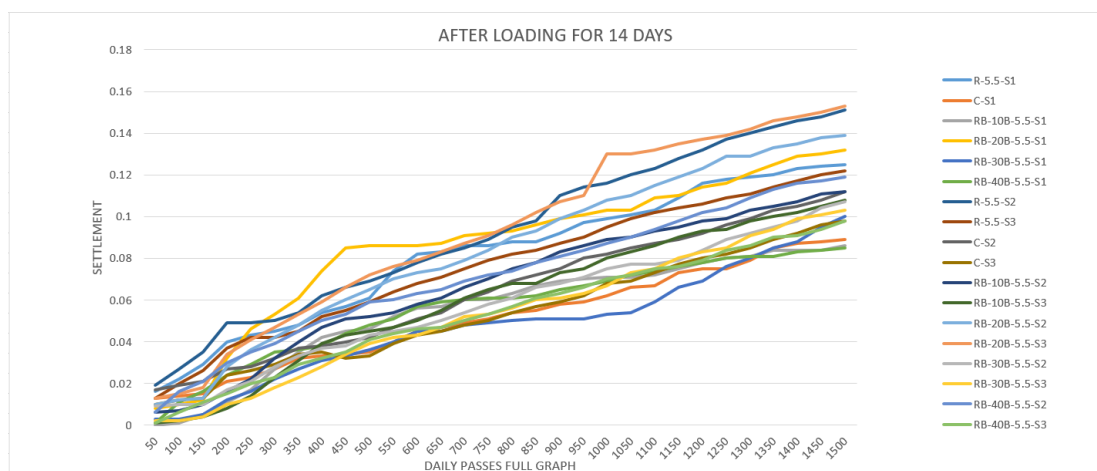

Figure 4: Full graph for 15 days (after)

For full graph for 15 days after the loading as shown in figure 4, Repomix-B with 20% still has the highest value of cumulative settlement at 1500 passes which is 0.153mm. Then, for the lowest is Repomix-B with 10% sample 3, Repomix-B with 40% sample 1 and Repomix-B with 40% sample 3 which is 0.001mm of cumulative settlement at 50 passes. The trend for this full graph before loading for all samples are increasing.

3.2.2 Different height of settlement vs daily passes

This data graph was collected after loading. This graph show the different height of settlement against daily passes. Figure 5 show the worst sample while figure 6 show the best samples.
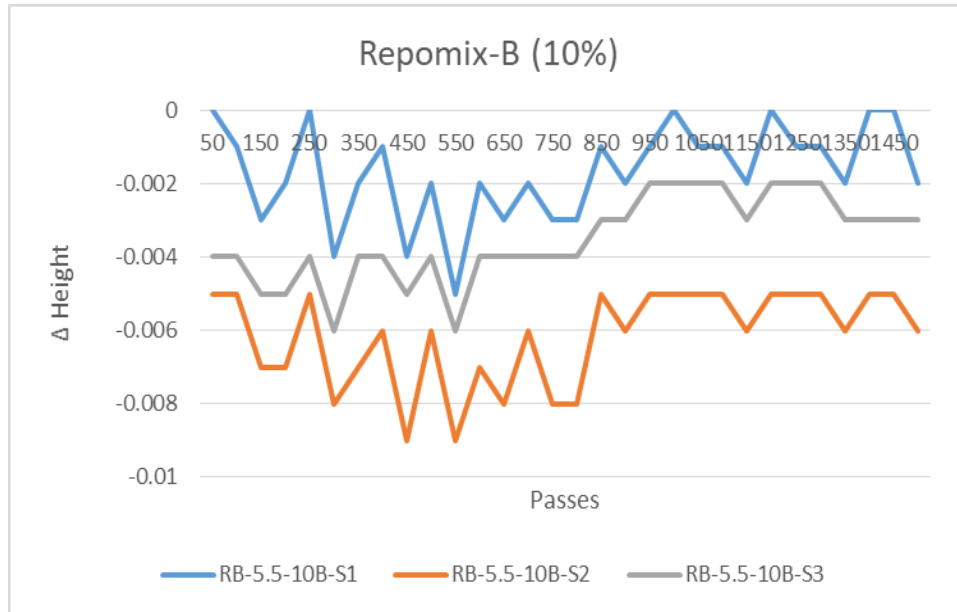
Figure 5: Data analysis for Repomix-B (10%)

Compare to all the samples for Repomix-B with 10% of bentonite is the worst samples because all of the 3 sample for Repomix-B with 10% bentonite is constant late at 1050 passes compare to the other samples. The settlement value for Repomix-B with 10% bentonite is also the lowest which is at -0.003mm.
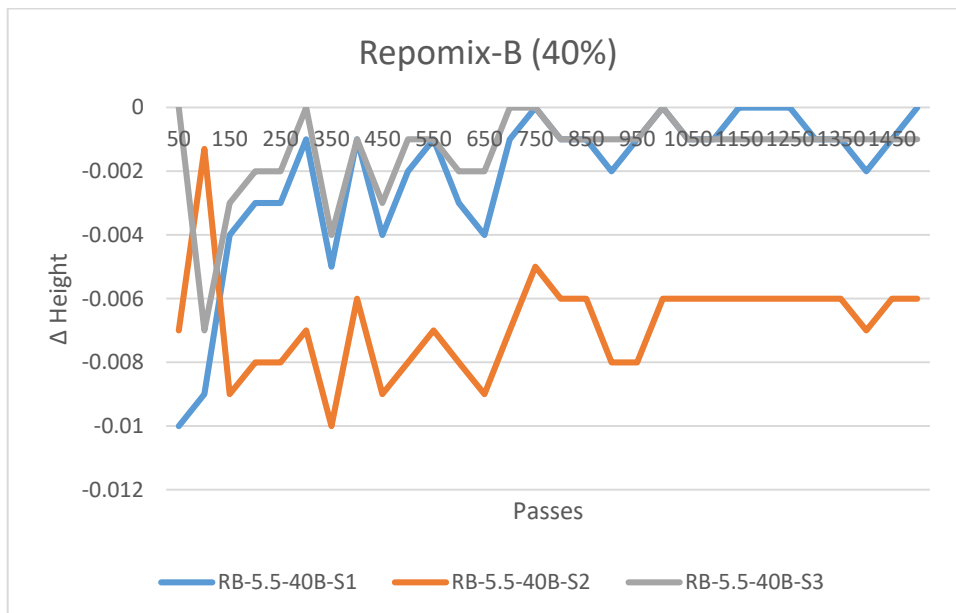
Figure 6: Data analysis for Repomix-B (40%)

Compare to all the samples for Repomix-B with 40% of bentonite is the best samples because all of the 3 sample for Repomix-B with 40% bentonite is mostly more constant at 1050 passes compare to the other samples. The settlement value for Repomix-B with 40% bentonite is also the lowest which is at -0.001mm.

4. Conclusion

This research was successfully and well-made base on the chosen concept and set. From all the data, the best sample was Repomix-B with 40% of bentonite. This can be proof that the more the bentonite content, the better the samples. For this research in the future, the author need to focus more when preparing the sample, using a correct way to mix the bentonite with the Repomix and correct ratio when mix the mixture with the bentonite. The author need to choose a correct aggregate size to make Repomix and mix it with the bentonite. Furthermore, when on site, before patching the pothole, make sure that the pothole is dry from water.

Acknowledgement

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