Analysis of Road Surface Damage Level on Road Surface Campurejo-Wates, Temanggung Regency using The SDI (Surface Distress Index) Method

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ABSTRACT
The The road is the access used by everyone to get to the place they want to go. Therefore, the existence of good access facilitate the means of transportation pass easily. Basically, along with advances in technology, development, and transportation, the quality of the roads will get better which was originally known as macadam roads (rough pavement), now has developed into hot mix asphalt/asphalt roads (flexible pavement). Now the constituent materials in road pavements are also easier to assemble and moreover the process is faster, because they have been assisted by much more sophisticated tools. In this case, with the facilities that have been developed by researchers and experts, the stages in the planning, manufacture, and maintenance process. Researchers developed a variety of different methods, including; method that is often used and until now has become a reference in research. There are SDI, RCI, PCI, IRI and so on. Such as the research conducted on the road section on the Campurejo-Wates road section. This study uses the SDI method from the District Office of Highways for analyzing, researching, and interpreting. A total of 22 segments with a total of STA+7850 with 76 stations . There are 8 segments that have been identified in this study. In collecting data, researchers used 2 data variables, namely; Primary Data and Secondary Data. In Primary Data, the researcher emphasizes direct research in the field/direct surveys at the location. Meanwhile, in secondary data collection, researchers get data from related agencies. The test results obtained an average SDI of 4.873418 which was collected from the cumulative total SDI data of 8 segments per 100 m with a total distribution of 76 STAs.There are several classifications of damage obtained in this study, such as; cracked hair, cracked crocodile skin, and heavily damaged. So, it is necessary to strive for maintenance and improvement in this section.

Keywords: *road STA, data, and application method*

1. INTRODUCTION

The Roads are infrastructure in supporting the pace of the economy as well as, role in the progress and development of a region. Indonesia as developing countries are in dire need of quality and quantity of roads in order to meet the needs of the population to carry out various types of activities economic activity in the field of movement of goods and services. Damage to the road will cause a lot of loss for all community, because it will greatly slow down the pace of convenience of the means of transportation. Basically pavement life planning and damage handling road surface, Aiming for changes to the management system economy and population mobility. In order to maintain the stability of transportation and smooth movement of goods and services is maintained, the relevant agencies must conduct an evaluation and direct site inspection so that the level of damage pavement can be scheduled in a planned manner. This direct review aims to determine whether the road is still feasible or not there is a need to improve the road pavement. Effort form of review and direct evaluation is usually carried out a surface damage survey the path set in the visual data, As for the steps taken this time refers to several research methods, of which there is a method of Clan and SDI. In this case, the research was carried out on the Campurejo . road section Wates Temanggung Regency which includes 2 villages is scheduled for review directly with the survey agenda

by determining the data variables to be processed carefully, so that in the future there will be improvements and continuous maintenance in accordance with the level of community needs the. Proper handling will increase the life of the road pavement and Inappropriate handling will only increase the budget for repair efforts pavement on the Campurejo-Wates road section. Research purposes. determine the feasibility of road conditions based on the SDI value obtained from visual observation and on-site inspection.

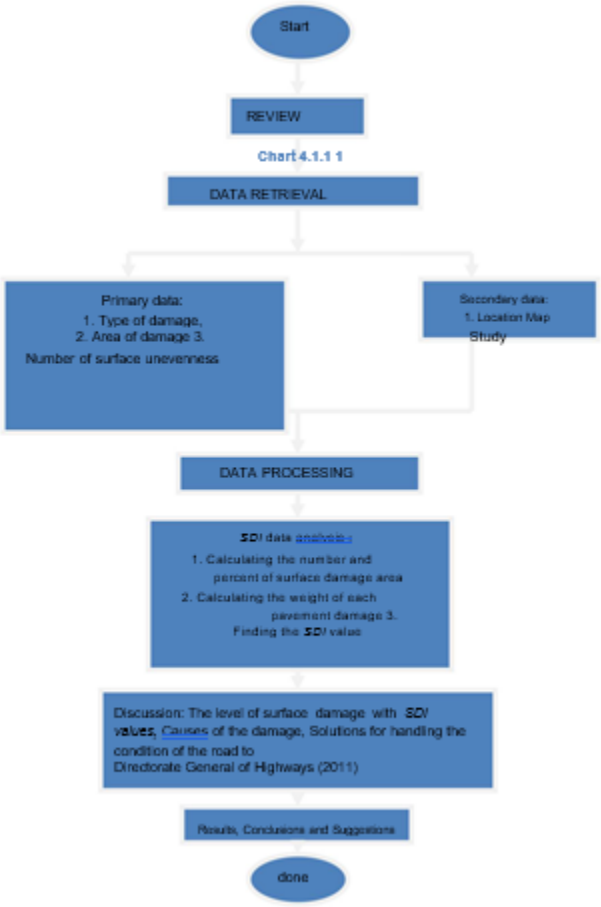
2. METHODS

Literature review

Final compiled by Tika Tresnandhini [1] with the title "Evaluating Road Surface Damage by Surface Method" The Distress Index (SDI)" has succeeded in researching roads using the SDI method which where the case study was conducted on the Grompol-Jambangan road, Karanganyar, Central Java Province as assessed by Average Daily Traffic Average, Traffic Volume, Pavement Type, Design Life, Level. Road Failure and Damage, Rigid Pavement Design , maintenance of flexible pavement, which research method was carried out refers to 2 methods of data collection, namely: the determination of Primary Data and Secondary Data by obtaining an overall SDI value of 126.17. Final Project compiled by Permadi [2] with the title "Analysis of Road Surface Conditions Using SDI and RCI Methods And Handling It" has succeeded in researching the Rendeh-Cikalong Regency road section West Bandung which stretches for 6.39 Km STA 4+600-6+390. By using 2 comparison methods, namely: SDI and RCI with a value of SDI 127 (slightly damaged), RCI 4.37 by adding an additional variable, namely road maintenance efforts. Final Project compiled by [3] with the title " Identification of Road Damage and Handling of Road Damage on Road Sections Sadang (Bts. Kab. Lamongan)–Lohgung(Km.93. 175)". Successfully identified the Sadang road, Lamongan Regency to Lohgung at Km. 93-175 identify the type of damage and determine the type of damage that exists in the that road segment. Journal of Civil Engineering Thesis compiled by [4] SDI Me,thSoadle-hW(2e0s2t 0S)uwmiathtrtahePrtoitvlein"cReoBadouDnadmarayg".eIdAennatliyfysi5s Sofetghme eLnutbsiswTithalaunk Kavuearnatgaen SDI value between 100-150 into the Slightly Damaged category with the following percentages; 82.5% cracks, 59% potholes and 17.4 . ruts

Research methods

This research was conducted by conducting a direct survey to the field and classifying pavement damage based on the type and the degree of damage. The first step in conducting this research is by first knowing, recognizing and studying the background from the area that is the object of research so that a formulation is obtained problems that exist for further research purposes [5]. After that, collect the various kinds of data needed to carry out. This research consists of primary data and secondary data. Primary data in This research was obtained from a road condition survey on the Campurejo-Wates road section UPT 3 Temanggung Regency. While the secondary data in this study obtained from the Commitment Making Officer (PPK) 7a. The next step is to evaluate the damage to the road surface with the pavement condition assessment system according to Highways for know the condition of the road. The steps of the research process on conditions the road surface can be done in the following flowchart Figure:



3. RESULTS AND DISCUSSION

In this chapter, we will discuss the results of the field study research conducted starting from a survey related to research data (covering collecting data in the field and data from relevant agencies); result of data analysis The pavement surface damage was analyzed using the method SDI and processed in Ms. Excel. Furthermore, the researcher will know the results of the research conducted carried out in the field, identified, and in general the results will be read Thus the researcher concludes the type of damage studied while in the in the field. These results are obtained from the results of calculations in chapter previously.

Field Geometric Data

Geometric data of the road is data about the geometric condition of segment under study and represent the characteristics of the road segment. Geometric conditions consists of a situation plan (land use, road markings, and intersections) and cross section of the road (road width and shoulder width). Based on the results measurements and visual observations directly in the field, data obtained The width of the road in segment 1 is 4.5 m with a shoulder of 1 m without a median.

Segment Identification

The purpose of segment identification is to find out the geometric data general segment of the Campurejo-Wates road which is divided into 8 segments per 1000 meters. The segments will then be presented in tabular form. as in Table 12 below.

Table 12. Road Segment Table

Segment	Area Type	Wide Street	Shoulder Width Right	Shoulder Width Left	Drainage
Segment 1 (0 m– 1000 m)	4.5 m– settlement		1 m	1 m	
Segment 2 (1000 m – 2000 m)	hills	3 m	1 m	1.5m	There isn't any
Segment 3 (2000 m – 3000 m)	Settlement	3 m	1 m	1 m	
Segment 4 (3000m - 4000m)	hills	3 m	1 m	1.5m	There isn't any
5 (4000 m – 5000 m)	hills	3 m	1.5m	1.25 m None	
Segment 6 (5000 m – 6000 m)	hills	3 m	1 m	1 m	There isn't any
Segment 7 (6000 m – 7000 m)	hills	3 m	0.5m	0.5m	There isn't any
Segment 8 (7000 m – 7850 m)	hills	3 m	0.25 m	0.25m None	

Review of Pavement Conditions With Surface Distress Index (SDI)

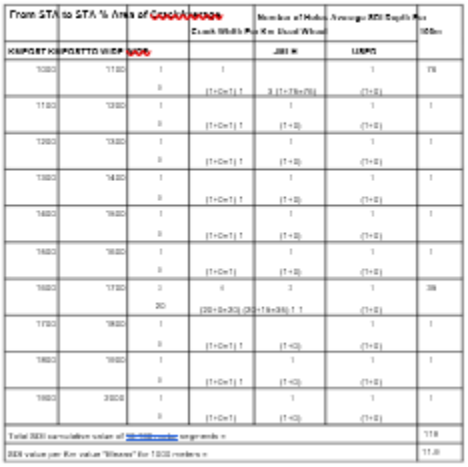
The level of surface damage of the Campurejo-Wates section is assessed by using the Surface Distress Index (SDI) for the whole of each type and the level of damage to each road segment, so that the results obtained the percentage of the level of damage that can be seen in the table below, and before getting the results of % crack area, crack width, number of holes, wheel depth, until the SDI value is obtained, the following is an explanation of how to: obtain the % crack area code up to the SDI value previously discussed in Theoretical basis.

Table 1. Table of SDI Values

From STA	to STA	% Area of Cracks	Crack Width	Number of Holes	Average RSI (Left)	For 100m
KEPOAT	KEPOATTO	WIDE	Amount		LEFT	
0	100	1 0	1 (1+0=1)	1 (1+0)	1 (1+0)	1
100	200	1 0	1 (1+0=1)	2 (20+10=30) 1	1 (1+0)	30
200	300	1 0	1 (1+0=1)		1 (1+0)	1
300	400	1 0	1 (1+0=1)	1 (1+0)	1 (1+0)	1
400	500	1 0	1 (1+0=1)	2 (20+10=30) 1	1 (1+0)	30
500	600	1 0	1 (1+0=1)		1 (1+0)	1
600	700	2 5	3 (5+0=5)	1 (1+0)	1 (1+0)	5
700	800	1 0	1 (1+0=1)	2 (20+10=30) 1	1 (1+0)	30
800	900	2 5	3 (5+0=5)		1 (1+0)	5
900	1000	1 0	1 (1+0=1)	1 (1+0)	1 (1+0)	1
Total SDI cumulative value of 10 segments =						120
SDI value per Km value "Wilcana" for 1000 meters =						12

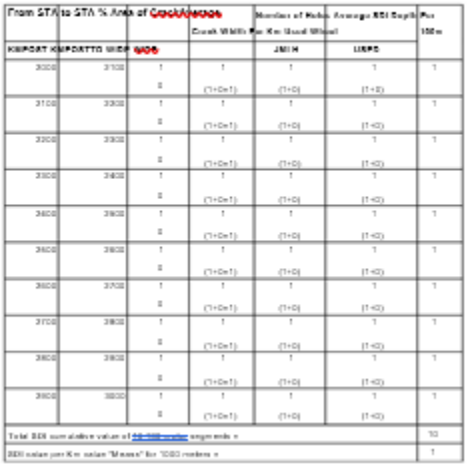
From the data table above, it is found that the % of the crack area is 10(0,1) % because the range is less than 10%, the crack width is 0, the number of holes is 112(11,2) is at weight no.3 with a range of 10-50/100 m, and the average is rut depth of 10(0,1) is at weight no.2 with a size range of of 1 cm deep. Next is the total value of SDI, from the calculation result of 4 variable, the SDI value of 120 is included in the lightly damaged category with range 100-150 with the concept of periodic maintenance as a method handling.

Table 2 Table of SDI II Values



From the data table above, it is found that the % of crack area is 20(0,2) % because the range is less than 10%, the crack width is 0, the number of holes is 111(11,1) is at weight no.3 with a range of 10-50/100 m, and the average is rut depth of 10(0,1) is at weight no.2 with a range less than 1 cm deep. Next is the total SDI value, from the calculation results 4 variables, the SDI value of 119 is included in the lightly damaged category with range 100-150 with the concept of periodic maintenance as a method. handling.

Table 3 Table of SDI III Values



From the data table above, it is found that the % of the crack area is 10(0,1) % because the range is less than 10%, the crack width is 0, the number of holes is 10(0,1) is at weight no.3 with a range of 10-50/100 m, and the average is rut depth of 10(0,1) is at weight no.2 with a size range of of 1 cm deep. Next is the total value of SDI, from the calculation result of 4 variable, the SDI value of 10 is in the good category with a range of less than 50 with the concept of routine maintenance as a handling method.

Table 4 Table of SDI IV Values

From STA to STA		% Area of Crack	Average Crack Width Per Km Used Wheel	Number of Holes	Average SDI Depth	Per 100m
KMPO ST	KMPO STTO		LARGE	JMLH	USED	
3000	3100	1 0	1 (1+0=1)	1 (1+0)	1 (1+0)	1
3100	3200	1 0	1 (1+0=1)	1 (1+0)	1 (1+0)	1
3200	3300	1 0	1 (1+0=1)	1 (1+0)	1 (1+0)	1
3300	3400	1 0	1 (1+0=1)	1 (1+0)	1 (1+0)	1
3400	3500	1 0	1 (1+0=1)	1 (1+0)	1 (1+0)	1
3500	3600	1 0	1 (1+0=1)	1 (1+0)	1 (1+0)	1
3600	3700	1 0	1 (1+0=1)	1 (1+0)	1 (1+0)	1
3700	3800	1 0	1 (1+0=1)	1 (1+0)	1 (1+0)	1
3800	3900	1 0	1 (1+0=1)	1 (1+0)	1 (1+0)	1
3900	4000	1 0	1 (1+0=1)	1 (1+0)	1 (1+0)	1
Total SDI cumulative value of 10 100 meter segments =						10
SDI value per Km value "Means" for 1000 meters =						1

From the data table above, it is found that the % of the crack area is 10(0,1) % because the range is less than 10%, the crack width is 0, the number of holes is 10(0,1) is at weight no.3 with a range of 10-50/100 m, and the average isrut depth of 10(0,1) is at weight no.2 with a size range of of 1 cm deep. Next is the total value of SDI, from the calculation result of 4 variable, the SDI value of 10 is in the good category with a range of less than 50 with the concept of routine maintenance as a handling method.

Table 5 Table of SDI V Values

From STA	to STA	% Area of Crack	Average Crack Width Per Km Used Wheel	Number of Holes	Average SDI Depth	Per 100m
KMPO ST	KMPO STTO	WIDE	WIDE Amount		USED	
4000	4100	1 0	1 (1+0=1)	1 (1+0)	1 (1+0)	1
4100	4200	1 0	1 (1+0=1)	1 (1+0)	1 (1+0)	1
4200	4300	1 0	1 (1+0=1)	1 (1+0)	1 (1+0)	1
4300	4400	1 0	1 (1+0=1)	1 (1+0)	1 (1+0)	1
4400	4500	1 0	1 (1+0=1)	1 (1+0)	1 (1+0)	1
4500	4600	1 0	1 (1+0=1)	1 (1+0)	1 (1+0)	1
4600	4700	1 0	1 (1+0=1)	1 (1+0)	1 (1+0)	1
4700	4800	1 0	1 (1+0=1)	1 (1+0)	1 (1+0)	1
4800	4900	1 0	1 (1+0=1)	1 (1+0)	1 (1+0)	1
4900	5000	1 0	1 (1+0=1)	1 (1+0)	1 (1+0)	1
Total SDI cumulative value of 10 100 meter segments =						10
SDI value per Km value "Means" for 1000 meters =						1

From the data table above, it is found that the % of the crack area is 10(0,1) % because the range is less than 10%, the crack width is 0, the number of holes is 112(11,2) is at weight no.3 with a range of 10-50/100 m, and the average is rut depth of 10(0,1) is at weight no.2 with a size range of of 1 cm deep. Next is the total value of SDI, from the calculation result of 4 variable, the SDI value of 10 is in the good category with a range of less of 50 with the concept of routine maintenance as a handling method.

Table 6 SDI VI . Value Table

From STA KMPO	to STA KMPO	% Area of Crack WIDE	Average Crack Width Per Km	Number of Holes Per Km	Average Rut Depth USED	SDI Per 100m
5000	5100	1 0	1 0	1 0	1 0	0
5100	5200	1 0	1 0	1 0	1 0	0
5200	5300	1 0	1 (1+0=1)	1 (1+0)	1 (1+0)	1
5300	5400	1 0	1 (1+0=1)	1 (1+0)	1 (1+0)	1
5400	5500	1 0	1 (1+0=1)	1 (1+0)	1 (1+0)	1
5500	5600	1 0	1 (1+0=1)	1 (1+0)	1 (1+0)	1
5600	5700	1 0	1 (1+0=1)	1 (1+0)	1 (1+0)	1
5700	5800	1 0	1 (1+0=1)	1 (1+0)	1 (1+0)	1
5800	5900	1 0	1 (1+0=1)	1 (1+0)	1 (1+0)	1
5900	6000	2 5	3 (5+0=5)	1 (5+0)	1 (5+0)	5
Total SDI cumulative value of 10 100 meter segments =						12
SDI value per Km value "Means" for 1000 meters =						1.2

From the data table above, it is found that the % of the crack area is 10(0,1) % because the range is less than 10%, the crack width is 0, the number of holes is 112(11,2) is at weight no.3 with a range of 10-50/100 m, and the average is rut depth of 10(0,1) is at weight no.2 with a size range of of 1 cm deep. Next is the total value of SDI, from the calculation result of 4 variable, the SDI value of 14 is included in the lightly damaged category with range less than 50 with the concept of routine maintenance as a method handling.

Table 7 SDI VII. Value Table

From STA to STA % Average Crack Area		Number of Holes Average SDI Depth Per Crack Width Per Km Used Wheel 100m				
KMPOST	KMPOSTTO	WIDE WIDE		JMLH	USED	
6000	6100	1 0	1 0	1 0	1 1	0
6100	6200	1 0	1 0	1 0	1 1	0
6200	6300	1 0	1 (1+0=1) 1	1 (1+0)	1 (1+0)	1
6300	6400	1 0	(1+0=1 0	1 (1+0)	1 (1+0)	1
6400	6500	3 20	3 (20+0=20) 3	1 (20+0) 1	1 (20+0)	20
6500	6600	3 20	(20+0=20) 1	(20+0)	1 (20+0)	20
6600	6700	1 0	(1+0=1) 1	2 (1+15=16) 1	1 (16+0)	16
6700	6800	1 0	(1+0=1)	(1+0)	1 (1+0)	1
6800	6900	3 20	3 (20+0=20) (20+15=35) 1 1	2	1 (35+0)	35
6900	7000	1 0	(1+0=1)	(1+0)	1 (1+0)	1
Total SDI cumulative value of 10-100 meter segments =						95
SDI value per Km value "Means" for 1000 meters =						9.5

From the data table above, it is found that the % of the crack area is 10(0,1) % because the range is less than 10%, the crack width is 0, the number of holes is 112(11,2) is at weight no.3 with a range of 10-50/100 m, and the average is rut depth of 10(0,1) is at weight no.2 with a size range of of 1 cm deep. Next is the total value of SDI, from the calculation result of 4 variable, the SDI value of 95 is in the medium category with a range of 50- 100 with the concept of routine maintenance as a handling method.

Table 8 SDI VIII. Value Table

From STA to STA % Area of Crack Average			Number of Holes Average SDI Depth Per Crack Width Per Km Used Wheel			100m
KMPOST	KMPOSTTO	WIDE WIDE		JMLH	USED	
7000	7100	3 20	3 0	0	0	20
7100	7200	4 40	3 0	1 0	1 0	40
7200	7300	3 20	3 (20+0=20) 1	1 (20+0)	1 (20+0)	20
7300	7400	1 0	(1+0=1) 3	1 (1+0) 1	1 (1+0)	0
7400	7500	2 1	(5+0=5)	(5+0)	1 (5+0)	5
7500	7600	1 0	1 (1+0=1) 3	1 (1+0) 1	1 (1+0)	1
7600	7700	2 5	(5+0=50 (5+0) 3 2		1 (5+0)	5
7700	7800	3 20	(20+0=20) (20+15=35)		1 (35+0)	35
7800	7850	1 0	(1+0=1)	(1+0)	1 (1+_0)	1
Total SDI cumulative value of 10-100 meter segments =						127
SDI value per Km value "Means" for 1000 meters =						12.7

From the data table above, it is found that the % of the crack area is 10(0,1) % because the range is less than 10%, the crack width is 0, the number of holes is 112(11,2) is at weight no.3 with a range of 10-50/100 m, and the average is rut depth of 10(0,1) is at weight no.2 with a size range of of 1 cm deep. Next is the total value of SDI, from the calculation result of 4 variable, the SDI value of 127 is included in the lightly damaged category with range 100-150 with the concept of periodic maintenance as a method handling. After obtaining SDI data from the 8 road segments, The next step is to calculate the total area and amount of damage to each segment. To view the total calculation data for each segment

4. CONCLUSION

From the data that has been collected from the discussion data on the Campurejo road, Wates, Central Java Province, Temanggung Regency, located at Sta 0+1000 up to Sta 1000+7850 by calculating each segment taken 100 m, then it can be concluded the value of the level of damage, among others: The existing conditions on the Campurejo-Wates road section are in the road table good and slightly damaged by evaluating the SDI value obtained from processing data that has been processed very well.

ACKNOWLEDGMENT

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