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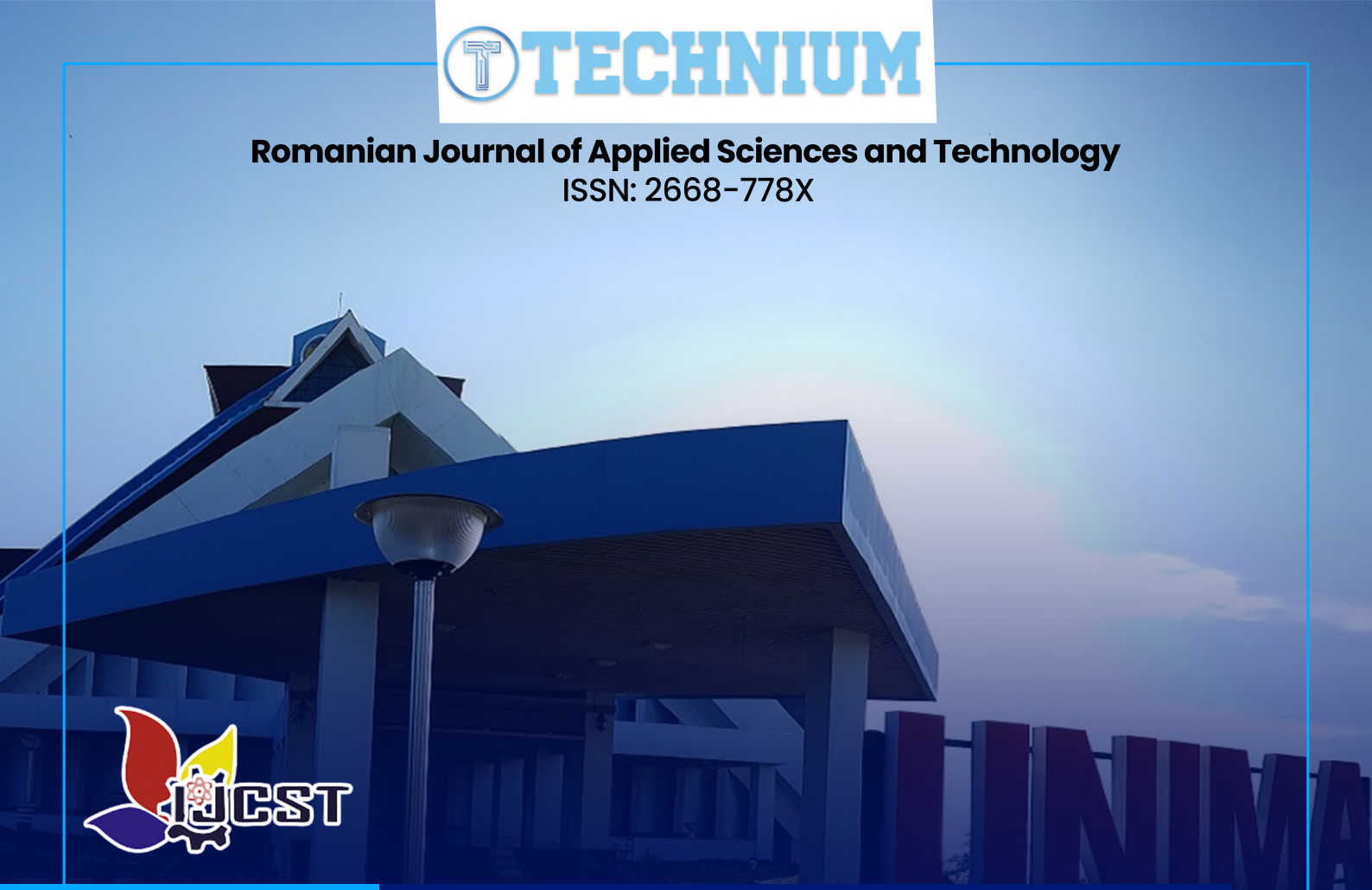

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# Utilization of Pavement Condition Index on Runway Pavement Sultan Babullah Ternate Airport

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**Abstract.** The Pavement Condition Index (PCI) assessment is one method used to assess the state of airport runway pavement. The runway (flexible pavement) of Sultan Babullah Ternate Airport, which has a size of 2300 m by 45 m, served as the site for PCI research in this study. The ASTM D5340-12 procedure (Standard Test Method For Airport Pavement Condition Index Surveys) was used to examine this PCI. The average PCI value of the entire sample was calculated from the results of the overall PCI study by averaging all PCI values for each sample, the results for the average PCI value of the entire sample were obtained at 60 (medium). Damage to STA 0+700 is on a bad scale with a PCI calculated value of 41, Damage to STA 0+750 is on a bad scale with a PCI calculated value of 41, Damage to STA 0+850 is on a bad scale with the value of the PCI calculation result is 31, Damage to STA 0+900 is on a bad scale with a PCI calculation result value of 36, Damage to STA 0+950 is on a bad scale with a PCI calculation result value of 34, Damage to STA 1+1050 is on a bad scale with a PCI calculation result value of 59.

Key word: *Pavement condition index, flexible pavement, ASTM D5340-12*

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# 1 Introduction

Sultan Babullah Airport – Ternate is located in Tafure Village, North Ternate City District, North Maluku Province, approximately 6 km north of Ternate City. This airport is one of the airports that is still managed by the Central Transportation Department. Babullah Airport is in a position between 127 - 128 East Longitude and 0 - 1 North Latitude with the runway at an altitude of 24 m above mean sea level. [1]

This airport has a runway of 2300m x 45m, currently capable of serving aircraft of the Boeing 737-500 and Boeing 737-800 types.

# 2 Literature review

The Pavement Condition Index (PCI) rates the condition of the pavement numerically, with 0 being the worst possible condition and 100 representing the best possible condition. An evaluation of the pavement's condition that takes the PCI value into account.[2] Fig. 1 show example of PCI rating scale

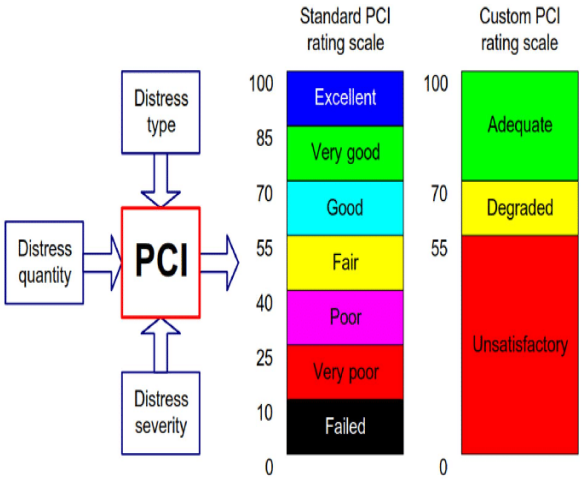


Fig. 1 the example of PCI rating scale (Shahin, 2005)[3]

## 2.1 Pavement condition index

Index of Pavement Condition (PCI) A pavement condition evaluation system based on the kind and degree of damage that occurs is called the Pavement Condition Index (PCI), and it can be used as a guide in maintenance efforts. The PCI approach can only provide data on pavement conditions at the time of the survey; it is unable to project conditions into the future. Pavement condition data, however, can be beneficial for forecasting future performance and utilized as an input for additional in-depth evaluations by conducting periodic condition surveys.[4]

## 2.2 Runway

A runway is a specific rectangular section within an airport that is laid out like a pavement and prepared for use by aircraft for takeoff and landing operations.
Pavement that is physically sound enough to handle the loads of the aircraft it serves is one of a runway's fundamental components. [5]

## 2.3 Airfield asphalt pavement

In general, the standard test method for airport pavement condition index surveys explains types of flexible pavement damage, as follows:
jet blast, jt. reflection (pcc), oil spillage, swell, shoving from pcc
• Deformation/distortion: rutting, corrugation, shoving, depression
• Cracking: longitudinal, transverse, diagonal, reflective, block, alligator
crack, crescent/slippage cracks.
• Surface defect: ravelling, bleeding, polishing,
• patching,[2]

# 3 Methodology [4]

## 3.1. Study area

The study was conducted on the Runway Pavement Sultan Babullah Ternate Airport, South Ternate city, Fig. 2 show research sites

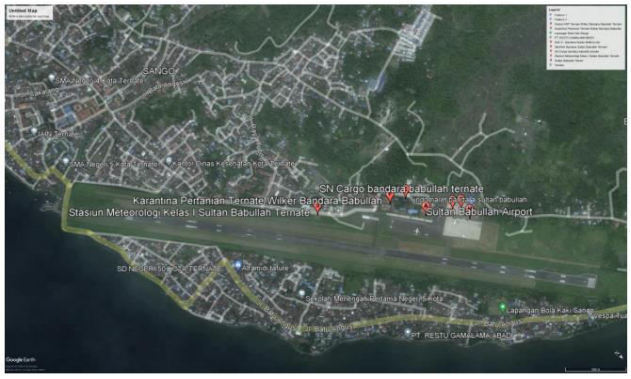

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Fig. 2 Sultan Babullah Ternate Airport

### 3.2. Data Processing

Utilizing the Pavement Condition Index on the Runway Pavement at Sultan Babullah Ternate Airport allowed for the type of damage to be covered after the findings of the survey of the state of the roads. The steps to perform a condition survey and obtain the PCI rating, as per the literature, are as follows: [6]:

- Examine the sample unit, ascertain the kind and degree of damage, and then calculate its density;
- The deduction value was determined by referring to the deduction value curve for each kind and degree of damage;
- Add up all of the individual deduction values to get the total deduction value (TDV);
  The corrected reduction (CDV) value can be calculated using the correction curve after TDV has been computed. If an individual reduction value is higher than the CDV when determining the CDV, the CDV was set to the highest individual reduction value;
- then, PCI was calculated, with PCI equal to 100 minus the CDV.Quotations must be centered and numbered with the digit on the right.

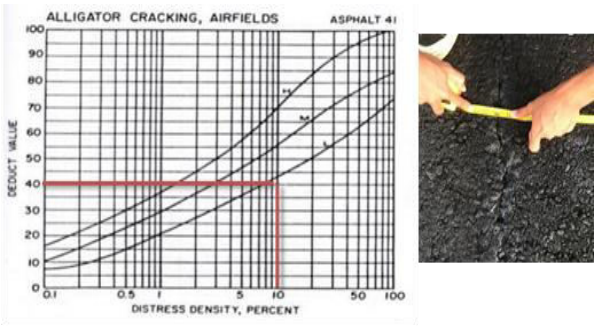


Fig. 3 Alligator cracking chart = 40[2]

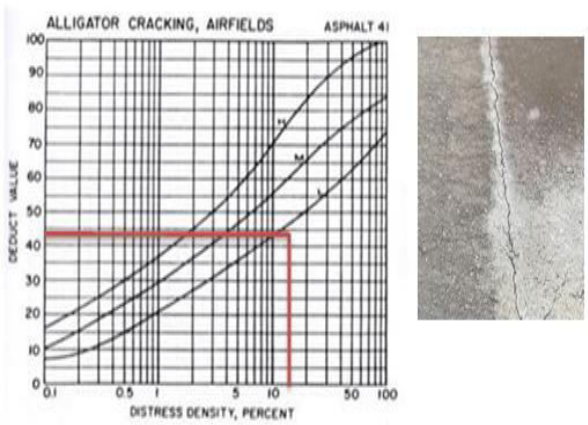


Fig. 4 Alligator cracking chart =43[2]

## 4 Results and Discussion

The results of observations at the study site were then processed and calculated to obtain a PCI value. In this article, a sample of sta 0 + 700 and sta 1 + 1050 is presented.

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Tabel 4.1 STA 0+700

| AIRFIELD ASPHALT PAVEMENT<br>CONDITION SURVEY DATA SHEET<br>FOR SAMPLE UNIT | | | | | | | | SKETCH: | | |
|---|---|---|---|---|---|---|---|---|---|---|
| BRANCH.....SECTION.....SAMPLE UNIT.....<br>SURVEYED BY.....DATE.....SAMPLE AREA..... | | | | | | | | | | |
| 2.Alligator cracking<br>2. Bleeding<br>3. Block cracking<br>4. Corugation | | 5. Depression<br>6. Jet blast<br>7. Jt. Reflection (PCC)<br>8. Long & trans cracking | | | 9. Oil spillage<br>10. Patching<br>11. Polished aggregat<br>12. Weathering/raveling | | | 13. Rutting<br>14. Shoving<br>15. Slippage<br>16.Swell. | | |
| DISTRESS SEVERITY | QUANTITY | | | | | | | | TOTAL | DENSITY % |
| 1 | 602 | 484 | 928 | 426 | 312 | 340 | 516 | 572 | 131,5 | 4311,5 | 9,5811111 |
| | 932 | 323 | 364 | 322 | 1020 | 130 | 740 | 520 | 336 | 4687 | 10,415555 |

Deduct Value Alligator cracking

Density = Ad/As x 100 %
Density = 4311,5/450 x 100 %
Density = 9,5811111 %

Density = Ad/As x 100 %
Density = 4687/450 x 100 %
Density = 10,415556 %

Allowble Number (m) of Deduct Alligator Cracking

$$m = 1 + {}^{m = 1 + 9}/_{95} \text{ x } (100 - \text{HDV})$$

m=1 + 9/95 x (100-40)= 6,7
m=1 + 9/95 x (100-43)= 6,4

Table 4.2 (Allowble Number of Deduct)

| STA | Distress Severity | Total | Density | DV | m | | q |
|---|---|---|---|---|---|---|---|
| 0+700 | 1 | 4311.5 | 9.5811111 | 40 | 6.4 | > | 2 |
| | | 4687 | 10.415556 | 43 | | | |

Total Deduct dan Corrected Deduct Value

Table 4.3 Total Deduct dan Corrected Deduct

| Segmen | STA | Distress Severity | DV | m | q | q1 | q2 | q3 | q4 | q5 | TDV |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 | 0+700 | 1 | 40 | 6.4 | 2 | 40 | 43 | - | - | - | 83 |
| | | | 43 | | | - | - | - | - | - | |

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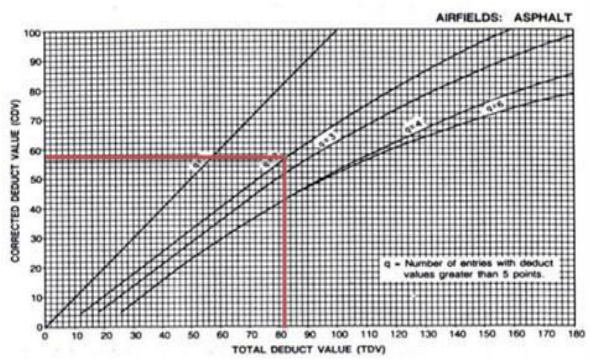


Fig.5 Corrected Deduct Value (CDV= 59) and Total Deduct Value (TDV = 83) chart[2]

Pavement Condition Index (PCI)

PCI = 100 – CDV Max
PCI = 100 – 59

Table 4.4 Pavement Condition Index (PCI)

| Segmen | STA | Distres Severity | Total | CDV | CDV max | PCI | T Ke |
|---|---|---|---|---|---|---|---|
| 14 | 0+700 | 1 | 4311.5<br>4687 | 59 | 59 | 41 | |

Table 4. 5 STA 1+1050

| AIRFIELD ASPHALT PAVEMENT<br>CONDITION SURVEY DATA SHEET<br>FOR SAMPLE UNIT | | | | SKETCH: | |
|---|---|---|---|---|---|
| BRANCH.....SECTION.....SAMPLE UNIT.....<br>SURVEYED BY.....DATE.....SAMPLE AREA..... | | | | | |
| 2.Alligator cracking | 5. Depression | 9. Oil spillage | 13. Rutting | | |
| 2. Bleeding | 6. Jet blast | 10. Patching | 14. Shoving | | |
| 3. Block cracking | 7. Jt. Reflection (PCC) | 11. Polished aggregat | 15. Slippage | | |
| 4. Corugation | 8. Long & trans cracking | 12. Weathering/raveling | 16.Swell. | | |
| DISTRESS SEVERITY | QUANTITY | | | TOTAL | DENSITY % |
| 12 | 7200 | 8492 | 13510 | 29202 | |

Deduct Value Polished Aggregate

Density = Ad/As x 100 %
Density = 29202/450 x 100 %
Density = 64,89 %

Deduct Value

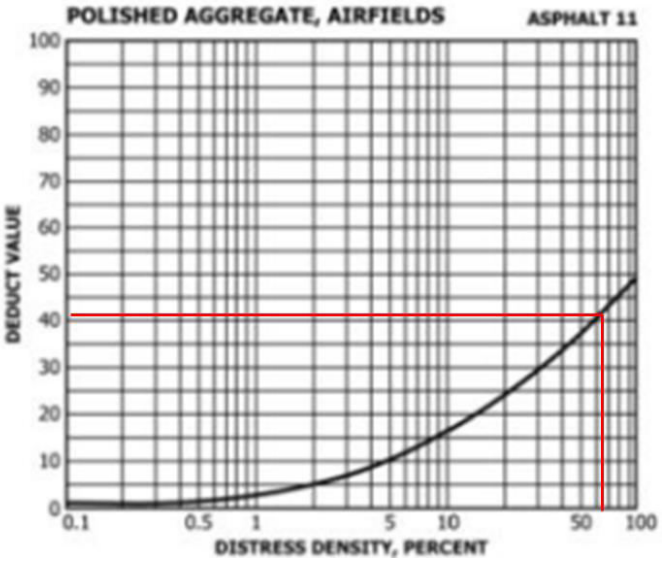


*Fig. 6 Polished Aggregat chart*[2]

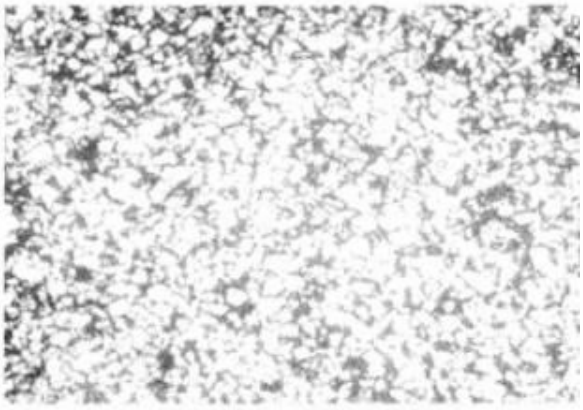
FIG. X1.53 Polished Aggregate

Fig. 7 Polished Aggregat[2]

Allowable number of value (m)

$m = 1 + {}^{m = 1 + 9}/_{95}$ x (100 − HDV)

m= 1 + 9/95 x (100-41)= 7

Table 4.6 (Allowble Number of Deduct)

| STA | Distress Severity | Total | Density | DV | m | q |
|---|---|---|---|---|---|---|
| 1+1050 | 12 | 29202 | 64,89% | 41 | 7 | 1 |

Total Deduct dan Corrected Deduct Value

Tabel 4. 7 Total Deduct dan Corrected Deduct Value

| Segmen | STA | Distress Severity | DV | m | q | q1 | q2 | q3 | q4 | q5 | TDV |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 21 | 1+1050 | 12 | 41 | 7 | 12 | 12 | | | | | 41 |

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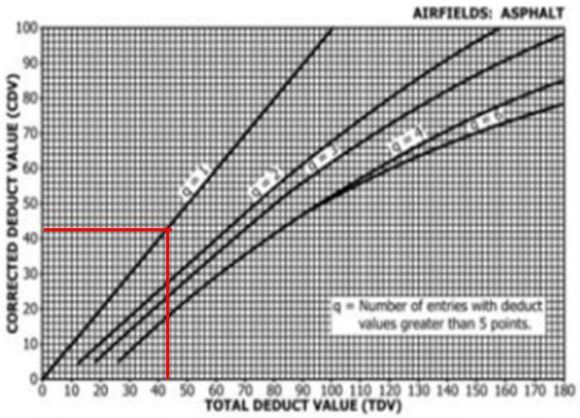


FIG. X3.20 Corrected DVs for Flexible Airfield Pavement

Fig. Corrected Deduct Value (CDV= 41) and Total Deduct Value (TDV = 41) chart[2]

Pavement Condition Index (PCI)

PCI = 100 – CDV Max
PCI = 100 – 41

Table 4.8 Pavement Condition Index (PCI)

| Segmen | STA | Distres Severity | Total | CDV | CDV max | PCI | K |
|---|---|---|---|---|---|---|---|
| 21 | 1+1050 | 12 | 29202 | 41 | 41 | 59 | |

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## 5 Conclusion

- STA 0+700 has damage that is on the bad scale and has a PCI estimated value of 41.
- STA 1+1050 has been damaged, and the PCI calculation result value for this damage is 59.

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