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Value of Halim Perdanakusuma Airport Pavement Classification Number (PCN) Runway with ELMOD 6 Application

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Abstract. The purpose of this study is to find out and analyze the value of PCN by using the ELMOD 6 application, which consists of inspection, maintenance and repairs on the runway if it indicated a decrease in carrying capacity. By knowing the accurate value of PCN, it will support the smooth operation of the flight. The method used in this study is a descriptive qualitative approach. Data collection by means of documentation studies, participant observation and in-depth interviews. The parameter in calculating PCN is the most critical B737-300 ER wide body aircraft with an Aircraft Classification Number (ACN) of 89 low category flexible pavement C code subgrade 6%. The results showed that the lowest PCN value was 80. This means that the PCN value of 80 is lower than the value of ACN 89 so that it is at risk for flight operations. Based on this findings, in the future we will need to do in-depth evaluations in order to archive are needed in order to achieve maximum flight safety.

Keywords: Aviation safety, airport, runway, Pavement Classification Number (PCN), Elmod 6 application.

1. Introduction

The Directorate General civil aviation of the Ministry of Transportation transferred the flight of prospective pilgrims from the embarkation of Halim Perdanakusuma Airport Jakarta to Soekarno - Hatta Banten Airport because the runway conditions peeled off after the flight of the wide body aircraft Boeing B777-300ER, with Maximum Take-Off Weight (MTOW) was 351,500 kg, the Heavy Federal Aviation Administration (FAA) category to transport the Hajj flight on Friday July 28, 2017 on Runway 06 - 24, with a length and width of 3000m x 45m type of flexible pavement.

The main objective of the ACN-PCN concept is to get an overview of aircraft loads that can be operated at an airport in unrestricted conditions (no load restrictions). PCN is a number that explains the pavement carrying capacity for unlimited aircraft operations with ACN values less than or equal to PCN. If the ACN value and aircraft wheel pressure are greater than the PCN value in a particular subgrade category published, the operation of the aircraft cannot be granted operating licenses except by reducing the operating load. In certain circumstances, operation of overload conditions can be given. [4] PCN is the figure which describes the quality and loading capability of the runway pavement. The PCN requires the following inputs from the runway pavement construction: Flexible or rigid Pavement surface quality aspect, Sublayer construction of runway. For a safe operation for big aircraft on an airport runway, the PCN number must be higher than the ACN

The ELMOD 6 application can do back calculation on basins, deflections, calculate Pavement Number Number (PCN), calculate the remaining life of the pavement and calculate the re-layer requirement. ELMOD 6 applies 3 (three) back calculation methods, namely the equivalent thickness method, finite element method, multi layer elastic method. The back calculation method processes load data, pavement thickness and deflection. The back calculation method processes load data, pavement thickness and deflection. The back calculation process resulted in the value of the subgrade correlated with the California bearing

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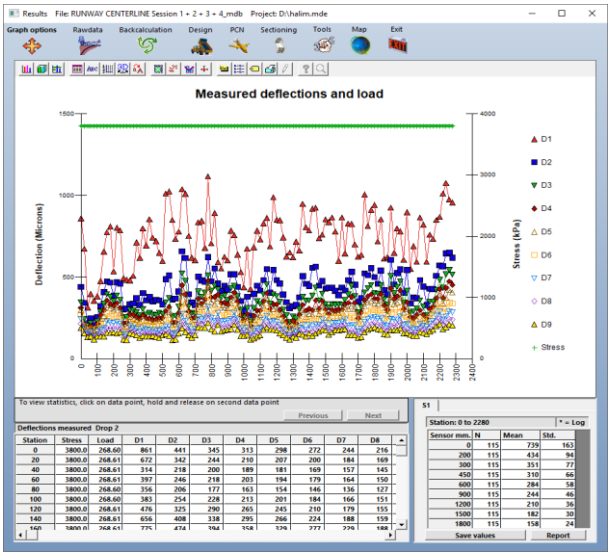
ratio (CBR) of the base of the flexible pavement or modulus of the reaction of the rigid pavement base soil. use the CBR or k value to calculate PCN. ELMOD 6 uses the E value of the pavement layers to calculate the critical stress or strain of pavement due to traffic loading.

The PCN calculation process is as follows: Runway deflection data analyzed only in the centerline area obtained from actual HWD devices. Runway structure data consisting of surface layers (Asphalt Concrete) thickness of 37 cm,base layer (river stone) thickness 17cm, sub base layer - (sand) thickness 13 cm, ground layer - 6% subgrade. Then look for the modulus of each layer, the most critical aircraft traffic data (annual departure) and aircraft types used are Boeing 777-300ER aircraft with MTOW of 351,500 kg ACN 89 low category flexible pavement C code for 6% subgrade, with an estimated growth rate of existing air traffic over the planned lifespan of 2,645,180. obtained using data collection with documentation study methods, participant observation and in-depth interviews, then the process is done using the ELMOD 6 application as follows test results in the field obtained actual deflection and load data at each test point where there is data deflection (micron) and stress data (kPa) generated describe the condition of the carrying capacity of each pavement layer with varying values as the author shows in the image below



Source: Elmod 6 application (processed by 2019 authors)

Figure.1.1. Deflection data and load

Then the findings of the modulus value (Mpa) of each layer of pavement and the point of testing the deflection (m) which illustrates the strength of the modulus of elasticity vary greatly at each test point, this will affect the bearing capacity of the pavement, as the author shows below

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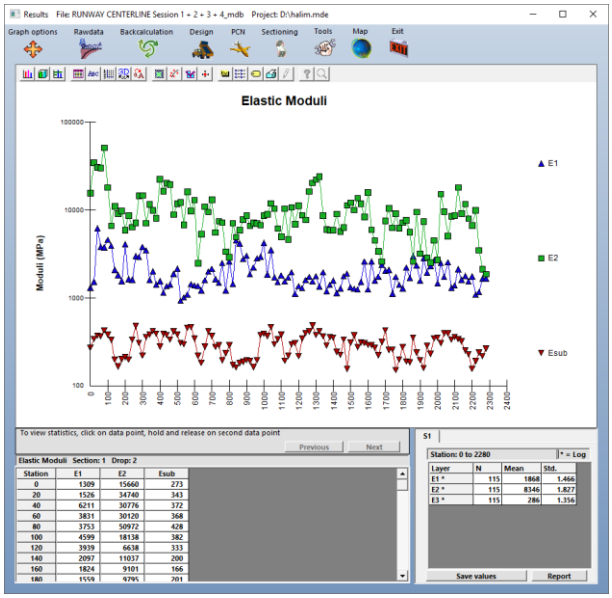
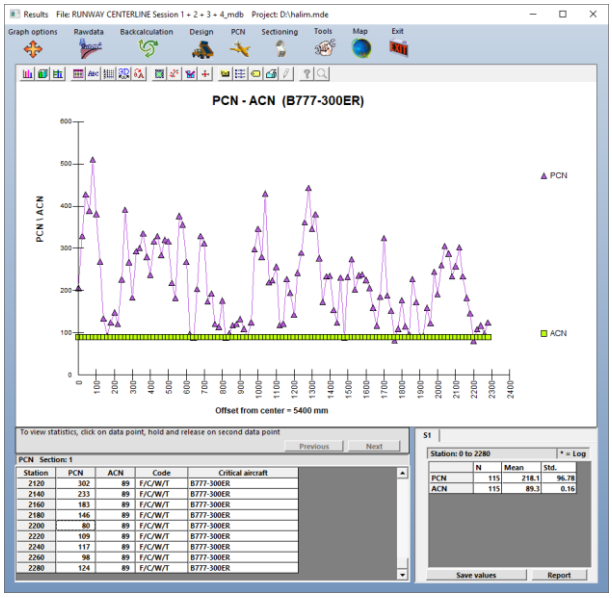


Source: Elmod 6 application (processed by 2019 authors)

Figure.1.2. The results of the runway deflection modulus

Then the results of the calculation of the PCN-ACN value with the critical aircraft type B777-300ER the ACN value of 89 is obtained with the low category C code for 6% subgrade, with the lowest PCN value is 80 which is found at several test points with 20 meter intervals as the author shows below



Source: Elmod 6 application (processed by 2019 authors)

Figure.1.3. PCN-ACN (B777-300ER) value results

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2. Method

This research is qualitative in nature, namely a research approach that produces descriptive data in the

the form of written or oral data from people and observable behavior (Lexy J Moleong 2002). Descriptive research was conducted to obtain information about the current situation. (Nyoman Dantes 2012). data collection is done in natural settings, primary data sources, and more data collection techniques in participant observation, in depth interview and documentation study. Catherine Marshall, Gretchen B. Rossman, stated that " the fundamental method relied on by qualitative researchers for gathering information are, participation in the setting, direct observation, in-depth interviewing, document review" (Sugiyono 2008 : 403). The data source in this study is the informant, among them are as follows: Head of Civil Engineering and airport environment Directorate General of Civil Aviation (Informant 1), Airport Infrastructure Verification Section Directorate of Airport (Informant 2), Consultant / Practitioner of Halim Perdanakusuma Airport Operator Jakarta (Informant 3).

3. Discussion and Result

The lowest PCN value is 80 obtained from the results of load stress levels and varying deflection values and elastic modulus values that describe the quality of the pavement layer after the various and actual layers at each test point and the temperature at the time of testing. With the most critical aircraft in operation, type B777-300ER with ACN is 89 for flexible pavement with low category, code C for subgrade 6% then In the future, an in-depth evaluation is required in the form of examination, repair, maintenance in the test point areas where the PCN value is lower than the ACN value.

Meanwhile, the research findings with documentation study data collection methods in the form of research conducted by Andius Dasa Putra (2010). the title of the Study of the Value of PCN Runway Based on Analytical Methods and Theoretic Methods at H. Asan Sampit Airport. The result uses the ELMOD 5 program with data collection of runway deflection in the field so that the actual data in the field where the measured subgrade support capacity is the subgrade condition just below runway pavement, The difference in the newer version of the ELMOD 5 application program is that in Elmod 6 it uses features that are easier than ELMOD 5. The equation is the actual runway deflection data and the process with the ELMOD program application coming from the same manufacturer.

Meanwhile the findings of the study were conducted by R. Maryo Triharso Seno and Ervina Ahyudanari (2015). Title Evaluation of the Strength of Air Side Pavement (Runway, Taxiway, Apron) of Juanda Airport with the ACN-PCN Comparison Method. Variables used in the form of Air Side Runway Pavement Strength ACN-PCN Comparison, data analysis with Quantitative Data Aircraft Manufacture method. COMFAA program to get the ACN value. Using the table of the Canadian Department of Transportation, with the result of comparing the ACN value using the COMFAA program, Manufacture aircraft and canadian transportation table to get ACN values, differences in qualitative methods, use the ELMOD 6 application to get the PCN-ACN value, The equation uses the Canadian transportation table as a reference for data supporting the ACN value. Meanwhile, based on in-depth interviews from the Airport Infrastructure Verification Section of the Airport Directorate with a work period of more than eleven (11) years, The Masters in Civil Engineering, University of Indonesia, Department of Transportation with Mr. Muhammad Anis are as follows: "For now ELMOD 6 is fast, accurate and can produce and search for real (real) elastic modulus directly in the field, calculate PCN values because with ELMOD the deflection value is actually obtained from the test results in the field".

In-depth interviews with consultants and Practitioners from PT. Angkasa Pura II with Position of PCN Consultants since 2001, from the Gadjah Mada University Civil Engineering

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Department with Mr. Nunu Lutfi as follows: "The ELMOD 6 application uses actual data in deflection deflection (primary data). The calculation results are more accurate, where deflection data for each tested point shows the quality of the pavement and deflection data will vary depending on the quality of the material the greater the deflection value the material, a low value actually with that condition automatically the data becomes factual from the data obtained in the real field so the results should be close to the actual. ELMOD 6 is analyzing deflection data so that it shows the quality of the material with the deflection obtained then input such as the type of material, thickness of pavement, then the ELMOD application will calculate, for example, with the deflection of so many qualities, the quality is indicated by the elastic modulus value in the value of each layer E1, E2, etc (in the ELMOD application) meaning that the E value can show the quality of the material what the modulus of elasticity is like ".

in-depth interview with the Head of Civil and Environmental Engineering Section of Balai Teknik Flight at the Directorate General of Civil Aviation with a work period of more than twenty (20) years, Mr. Rinaldi is as follows: "That the ELMOD 6 application, where the deflection number obtained is low will produce a high modulus of elasticity, whereas if the deflection rate is high, the modulus of elasticity is low so that the quality of each pavement material at the airport can be known. "That the ELMOD 6 application, where the deflection number is produced is high modulus of elasticity, whereas if the deflection rate is high, the modulus of elasticity is at the airport can be known.

4. Conclusion

From the results of literature review and in-depth interviews with research informants, the researchers concluded as follows: that using the ELMOD 6 application can produce a pavement carrying capacity (PCN), the elastic modulus and material quality values of each runway layer structure are actually obtained in the field, with deflection data as primary data in the calculation, process every point of the test area is obtained by using Heavy Weight Deflectometer (HWD) equipment, so that it is very concerned about the accuracy in order to achieve the security and safety of flight operations.

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