

ABSTRAK

UJI KELAYAKAN DATA PERHITUNGAN VOLUME *STOCKPILE* BATUBARA HASIL AKUISISI DATA *UNMANNED AERIAL VEHICLE* (UAV) TERHADAP DATA *TERRESTRIAL LASER SCANNER* (TLS)

Oleh
Jasen Yunandi

Kegiatan survei sangat bermanfaat dalam membuat topografi tambang guna mengetahui luasan dan kuantitas dari bahan galian, perhitungan kuantitas batubara dapat dilakukan dengan berbagai alat ukur salah satunya TLS dan UAV. Penelitian ini bertujuan untuk menguji kelayakan data perhitungan volume *stockpile* batubara hasil akuisisi UAV *fixed-wings Wingtra One Gen II* berbasis *Post Processing Kinematic* (PPK) terhadap data TLS RIEGL VZ-2000i, serta menilai apakah akurasi geometri UAV memenuhi standar PERKABIG Nomor. 18 Tahun 2021 dan toleransi *Industry Accepted Error* ASTM D6172-98.

Data yang digunakan terdiri dari data foto udara, data TLS, data *Ground Control Point* (GCP), data *Independent Check Point* (ICP), data *boundary* dan data *original*. Metode registrasi TLS menggunakan *direct-georeference* serta perhitungan volume menggunakan metode *end area* dengan konsep perhitungan *prismoidal*. Uji akurasi geometrik menggunakan metode RMSE dan Persentase selisih volume dihitung dan dievaluasi berdasarkan batas toleransi *industry accepted error* sebesar 2%. Perhitungan volume terbagi menjadi 2 bagian yaitu *stockpile* selatan-timur dan selatan-barat.

Hasil penelitian menunjukkan bahwa nilai selisih volume antara UAV dan TLS pada *stockpile* bagian selatan–timur sebesar 413,176 m³ (0,41%), sedangkan pada bagian selatan– barat sebesar 309,408 m³ (0,43 %). Nilai selisih tersebut masih dalam batas toleransi yaitu 2% menurut ASTM. Selain itu, hasil uji CE90 (0,046 m) dan LE90 (0,11 m) juga menunjukkan bahwa akurasi geometri UAV memenuhi standar PERKABIG Nomor.18 Tahun 2021 skala 1 : 1.000.

Kata kunci : UAV, TLS, *fixed-wings*, *Post-processing* dan ASTM

ABSTRACT

FEASIBILITY TEST OF COAL STOCKPILE VOLUME CALCULATION DATA FROM UNMANNED AERIAL VEHICLE (UAV) DATA ACQUISITION AGAINST TERRESTRIAL LASER SCANNER (TLS) DATA

**By
Jasen Yunandi**

Survey activities are highly beneficial for creating mine topography maps to determine the extent and quantity of mineral resources. Coal stockpile volume calculations can be performed using various surveying tools, including Terrestrial Laser Scanner (TLS) and Unmanned Aerial Vehicle (UAV). This study aims to evaluate the feasibility of coal stockpile volume data acquired by the fixed-wing UAV Wingtra One Gen II using Post-Processing Kinematic (PPK) against TLS RIEGL VZ-2000i reference data, and to assess whether the UAV's geometric accuracy meets the standards of PERKABIG No. 18 of 2021 and the Industry Accepted Error tolerance of ASTM D6172-98. Data utilized include aerial photographs, TLS data, Ground Control Points (GCP), Independent Check Points (ICP), boundary data, and original data. TLS registration employed direct georeferencing, with volume calculations using the end-area method based on the prismatic concept. Geometric accuracy was tested via RMSE, while volume difference percentages were evaluated against the 2% industry tolerance threshold. Volume calculations were divided into two sections: southeast and southwest stockpiles. Results indicate volume differences between UAV and TLS of 413,176 m³ (0.41%) for the southeast stockpile and 309,408 m³ (0.43%) for the southwest stockpile. These differences fall within the 2% ASTM tolerance. Additionally, CE90 (0.046 m) and LE90 (0.11 m) values confirm that UAV geometric accuracy complies with PERKABIG No. 18 of 2021 standards at a 1:1.000 scale.

Keywords: UAV, TLS, fixed-wings, Post-processing and ASTM