

# Strategy of Increasing Competence of Geological Mining Student in Geodetic Mining Survey

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**Abstract**—The purpose of this study is to improve the competency of mining geology students regarding geodetic survey mining that links and matches the mining industry. The method used in this study by using several methods namely Sharing knowledge, practice by using a geodetic survey tool and making a benchmark as a tie point for measuring geodetic surveys. The method of increasing the competency of mining geology students combines the basic theory of geodetic surveys with the application of geodetic surveys conducted in the field. The results of this study found a significant increase in the competence of mining geology students in terms of basic GPS theory in geodetic surveys, use of GPS handled, use of GPS Geodetics and being able to apply geodetic surveys in mining.

**Keywords**—competence; geodetic GPS; minning

## I. INTRODUCTION

It is common in geodetic practice that station geodetic coordinates in an old frame are measured/estimated by adjusting conventional leveling and vertical networks (together with a vertical datum), whereas their Cartesian coordinates in a new frame are measured/estimated by adjusting modern 3D Global Navigation Satellite System (GNSS) networks [1]. It is suggested that geodetic control network should be fixed with tape reflectors onto side surfaces of surrounding buildings, located out of zone of possible deformations [2]. In this study, we tested the "land-subsidence monitoring guidelines" proposed by the Italian Ministry of Economic Development (MISE), to study soil deformation along an on-shore hydrocarbon reservoir, proposing a protocol that includes shared use of the Global Positioning System (GPS) and techniques multi-temporal Interferometric Synthetic Aperture Radar (DInSAR) Differential, for the dual purpose of: a) monitoring the phenomenon of soil degradation along selected areas after defining the background of soil deformation. ; b) analyze the possible relationship between exploitation of hydrocarbons and anomalous deformation patterns [3].

Lack of accessibility to the Karakoram region has limited the use of conventional methods in monitoring variations in thickness and mass of glaciers, alternatively promoting the use of remote sensing-based methods, the present study quantifies changes in thickness and mass budget of 24 glaciers in East-Karakoram region using geodetic technique [4]. Integrated geological, geodetic and marine geophysical data provide

evidence of active deformation in south-western Sicily, in an area spatially coincident with the macro seismic zone of the destructive 1968 Belice earthquake sequence [5]. Changes in the pathway and timescale of magma ascent can be responsible for variations in eruptive style during long-lived eruptions, but are only documented at a small number of well-instrumented systems, integrate PS-InSAR from high resolution TerraSAR-X radar imagery with continuous GPS data from 4 sites at Tungurahua volcano, Ecuador [6].

Geodetic survey is a survey that is very important in geography in determining coordinates with various methods, besides that it can also be used in mining, hydrocarbons, civil engineering and others. This geodetic survey is using a geodetic GPS that has a fairly expensive price. In addition to this, special capabilities are needed in operating the equipment, processing data and interpreting geodetic data. Because of the many limitations of tools and technology, the ability of teachers and students is an obstacle in developing the knowledge of geodetic surveys. Therefore, a strategy is needed to improve the competence of mining geology students in understanding the basic theory, the use of tools and processing data in geodetic mining surveys. Periodic and continuous methods are needed in the development of student competencies.

## II. METHOD

The methods and activities carried out to improve competency in geodetic surveys are by conducting several methods in providing material on geodetic surveys to students in the mining geology department, namely by lecturing, practicing and making tools (making benchmarks).

The first method is by lecturing. This method is carried out by providing basic theoretical material regarding geodetic surveys. This basic theory is given periodically in an interesting and easily accepted manner by students in the mining geology department. Basic theory begins with basic GPS theory to the basic theory of geodetic surveys. In addition, it was also introduced regarding mining conditions in Indonesia, the introduction of mining geology, the introduction of geodetic survey tools, and the development of geodetic surveys. The method for delivering material is given in several methods, starting from basic theoretical material in the class to using forum group discussion (FGD).

The second method is by practice. This method is more effective in delivering material, because students are more evident in seeing geodetic survey applications in the field. The first thing to do is to carry out the basic theory of reuse in the field using the tools, so that the visual and basic theory can be clearly seen by mining geology students. After they understand the basic theory and tools used, then the method is to use a Geodetic GPS device in this case using a Trimod GPS geodetic device. Shiva mining geology sees and tries the GPS Geodetic Trimble brand, so they understand and understand each other in the use of this tool. The device starts and a geodetic GPS measurement simulation is carried out, so they understand and understand more about the application of its use. After they tried, they were taught processing data, to calculate corrections from the data generated and to interpret geodetic data. This mining geology student was introduced to software to calculate the geodetic data.

The third method is making benchmarks, can be seen in Figure 1. This benchmark is a reference point in the measurement of this geodetic survey. Making this benchmark, so that students and teachers of mining geology can do exercises and research, so that they can further explore geodetic survey in the future.



Fig. 1. Making a benchmark as a tie point in measuring geodetic surveys.

Before and after increasing this competency, a test was made. This test is given either verbally or by writing. The test is done spontaneously and there is an assessment team. As for what is meant spontaneously here, mining geology students are tested unconsciously, when they are practicing or they are at rest. This is done so that the mining geology students are not tense and not nervous. And the second is in a written way. This written test is done twice, before the material is given in lecture or in practice.

### III. RESULTS

The results of training in improving the competence of mining geology students, the results and evaluations obtained are:

#### A. Number of Training Participant

The target number of participants in this activity towards mining geology students is 100%, seen in Figure 2. The details of the number of participants were 5 teachers and 40 mining geology students. This amount is in accordance with the number of all mining geology students in SMK Tasikmalaya, West Java Province.



Fig. 2. Activities to improve the competence of mining geology students.

#### B. Training Target

The material provided at this training was carried out both indoors and outdoors, can be seen in Figure 3. Due to the limited time, place and funds available, training was conducted briefly, densely and precisely in accordance with the needs of mining geology students. After this training simulation, 80% of the material can be targeted to mining geology students. However, after training, the material delivered reaches 90%, so it has reached the target. This training is beyond expectations, because mining geology students are very enthusiastic and enthusiastic in accepting the material we have prepared. Although there are many obstacles, but the enthusiasm and enthusiasm of the students of mining geology make all the material well absorbed by mining geology students.



Fig. 3. Situation of providing geodetic survey material in class and outside the classroom.

#### C. Training Lesson Target

The material provided is not in detail and is only done in outline. From the material that has been prepared and given, the target material delivered is 80%. However, in the results, the material provided reached 87.5% for mining geology students to improve their competencies and skills.

#### D. Training Skill Target

Competence and abilities of mining geology students are viewed from a comprehensive examination of the exam at the end of the activity. The assessment is done by written test, verbal and practice. As for seeing the results of their improvement, an assessment of their skills and competencies was carried out by giving questions that were solved by practice. And the results from mining geology students training participants have a value of 80. This is beyond our target of around 70. So, they get a significant increase in competence and skills.

TABLE I. INDICATOR OF ACHIEVEMENT OF PKM-P3M ACTIVITY EFFICACY IN COMPREHENSIVE FINAL EXAMINATION

No	Indicator	Before	After
1	Introduction to GPS	25%	85%
2	Training on the Use of GPS Handled	20%	85%
3	Geodetic GPS Use Training	15%	80%
4	Application of Geodetic Survey	10%	80%

#### IV. CONCLUSION

The results that can be obtained from the training to improve the competence of teachers and mining geology students regarding geodetic surveys can be said to be very successful and successful. Success here is due to the very significant increase of mining geology students regarding geodetic mining surveys. As for succeeding because the target applied from the start, until the activities have been completed can be on target, even exceeding the targeted expectations. The big point is the desire and enthusiasm of mining geology students in accepting material that they think is very useful and

open their eyes to mining in this case a geodetic survey. From the results of this training, the strategy to improve competency is an excellent solution in improving students' abilities and knowledge in the field of mining knowledge, so they are expected to be more developed in seeking knowledge, especially mining.

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