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Muhammad Tressna Gandapradana
Bukit Asam Tbk

Andryusalfikri
Bukit Asam Tbk

Sucipto Heri
Bukit Asam Tbk

Nugroho
Bukit Asam Tbk

Bagus Totok Purnom

See next page for additional authors

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THE IMPACT OF INTRUSION TO COAL CHARACTERISTICS IN TANJUNG ENIM, MUARA ENIM FORMATION, SOUTH SUMATRA

Muhammad Tressna Gandapradana[1], Andryusalfikri[1], Sucipto Heri, Nugroho[1], Bagus Totok Purnom, Arya Gustifram[1], Akmal Farid

ABSTRACT: Tanjung Enim is one of the most well-known coalfields in Indonesia. It is situated in the middle of the South Sumatra Basin while the main coal produces from the lower group of Muara Enim Formation, Miocene-Pliocene in age. The lower group of the Muara Enim Formation consists of five main seams overlying the Air Benakat Formation and intercalate with claystone, sandstone and tuffaceous sandstone. Intrusion existence and volcanism influence in the formation differs it from the coalfields in Borneo. Batholith and sill intrusion is example of volcanism activities in the area. This is a product of subduction phenomena which activate the ring of fire and Bukit Barisan in South Sumatera.

Research conducted by geological mapping and analysis of proximate data. Generally, coal lithotype in Tanjung Enim has varied characteristic. Coal near intrusions characterized by black color, bright 80% dull 20%, brittle, black streak, pyrite mineral was filled in cleat, conchoidal cleveage.Analysis indicates that calorific value near intrusion area has higher value than coal without intrusion effect. Calorific value of the coal near intrusion ranged from 7330 kCal/kg to 7855 kCal/kg. On the other side, coal from other location which is 3,5 km far from the intrusion has varied calorific value ranged from 4597 kCal/kg to 5099 kCal/kg of coal as received.

INTRODUCTION

Coal characteristics depend on the environment in which they were a deposited and preserved. The depositional environment leads to maceral type, composition of coal and chemical effect on the coal. One of the most significant associated factors in the coal facies is igneous rock intrusions (Thomas, 2013) as the place where the coal is formed and preserved could affect the coal maturity. Thus, the understanding of depositional environments and geological position of coal deposit is really imperative to characterize the coal and predict the characteristic pattern within geographical areas.

Tanjung Enim was one of the coal-rich areas located in the center of the South Sumatra Basin. Coal resource mainly comes from lower members of Muara thwEnim Formation which was deposited in Miocene-Pliocene. Muara Enim Formation has numerous coal seam but only 5 coal seam that are the main focus, there are the Mangus, Suban, Petai, Kladi and Merapi Seams. Three out of the five seams are regularly the target to mine due to thickness and broadarise. Those three seams consist of Mangus, Suban and Petai Seams. In some areas, Suban and Petai seams are split into two different seams while Mangus always found as two split seams in the whole area of Tanjung Enim. Enim River crosses from north to south and divide Tanjung Enim as 2 parts. Western part is known as Tambang Air Laya and Muara Tiga Besar mine. Otherwise, eastern part named as Banko mine.This paper will focus on the Western side due to its complexity caused by intrusions.

[1] *Geologist, PT. Bukit Asam Tbk. Email: tressna.gandapradana@gmail.com Tel: +62 812 9406 4040*

Generally, the geological conditions in Tanjung Enim were relatively simple. But different cases happen in Tambang Air Laya where intrusions exist and affect thecoal post-deposition characteristics. Magma intrusion caused temperature increased to near rock formation and alter the structural properties of the formation that will lead to increasing of pressure. It is known that temperature and pressure are two main factors that affect coal quality. The intrusion has also caused the formation of some new minerals, particularly in the coal which is highly metamorphosed Amijaya, (2006). Investigation of intrusion patterns, altered coals commonly showed increasing ash, vitrinite reflectance and its anisotropy and decreasing volatile matter adjacent to intrusions (Yao, 2011). Therefore, coal quality in Tambang Air Laya has a higher value than coal in other mine units with complex distribution of broad quality range in areas as indicated in Figure 1.

This paper will uncover the coal characteristics especially quality distribution on the effect of intrusion body and intrusion distance to quality in specific drillhole.

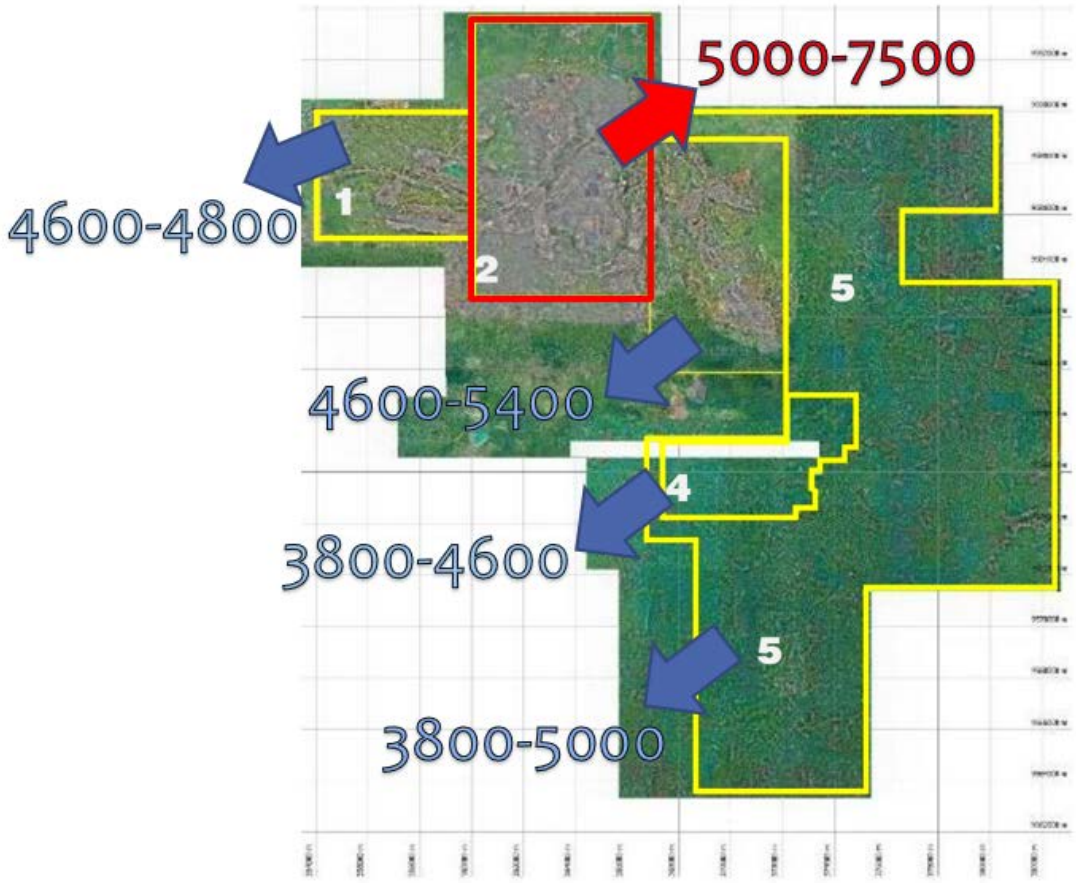

Figure 1: Location of Airlaya Coal Mine marked with Red Mark

DATA AND METHOD

This paper uses several methods applied to discover the implications of intrusion on coal characteristics. First, geological mapping conducted to reveal the geological conditions including lithology features that appear in the area, secondlysubsurface lithology also acquired by borehole data to have a better description of characteristic of the coal. Third, proximate analysis conducted from each coal sample to recognize the quality of coal such as inherent moisture value, ash, total sulfur and ultimately calorific value. Finally yet importantly, statistical approach used to know the average deviations of calorific value per distance of coal from the intrusion body. Figure 2 shows boreholes locations in the Tambang airlaya.

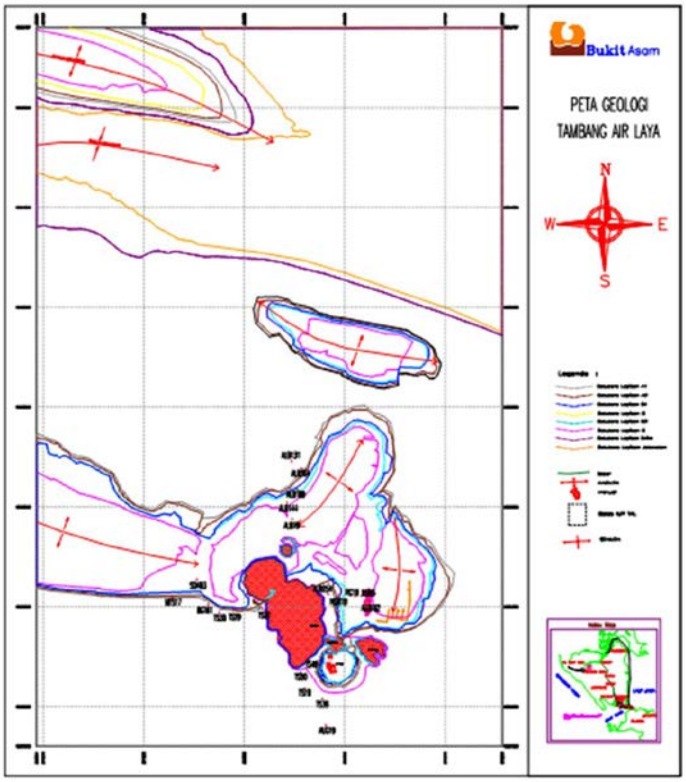

Figure 2: Borehole Location in Tambang Airlaya

RESULT AND DISCUSSION

Tanjung Enim coal resources come from the Muara Enim Formation that consistes of Sandstone-Claystone intercalated with coal seam. It was deposited during a regression phase in the South Sumatra Basin. Thus, it has a huge deposit of coal resources within the formation due to a deltaic environment and organic abundance. Geological features of the South Sumatra Basin are unique. It has marine to non-marine successions, deep marine to volcanic environments. Intrusions appear as post-depositional features. Volcanic and intrusions in the South Sumatra Basin appeared as part of convergence forces between the Hindia and Eurasia plate. This event leads to the formation of mountain chains (in this area represented by Bukit Barisan).

Research conducted by geological mapping at first, continued with proximate data analysis. From geological mapping, geology units of the field were obtained which consisted of sandstone, claystone, coal and andesitic intrusions. While proximate analysis resulted to coal quality primarily in calorific value. Coal in the southern side of the field has a higher value of calories. It is affected by heat produced from intrusion existence that supports the coal maturation. The closer the coal to the intrusion, the more calorific value it has. The higher quality coal reaches up to 7800 kcal/kg (as received), while lower value of calorie only reach 4597 kcal/kg (as received). This data is shown in = Figures 3 to 7.

Intrusion and coal maturity also implied to coal characteristics as description. Premium quality of coal represented by black color, bright 80% dull 20%, brittle, black streak, pyrite mineral filled in cleat, and conchoidal cleavage. Otherwise, coal without intrusion effect has brownish black color, massive, brown streak, friable and relatively clean from mineral.

It is recommended to explore more to the southern area due to higher quality in order to get more premium quality and more profit. For further research, the writer suggests to conduct research about trace element abundance due to intrusion effect.

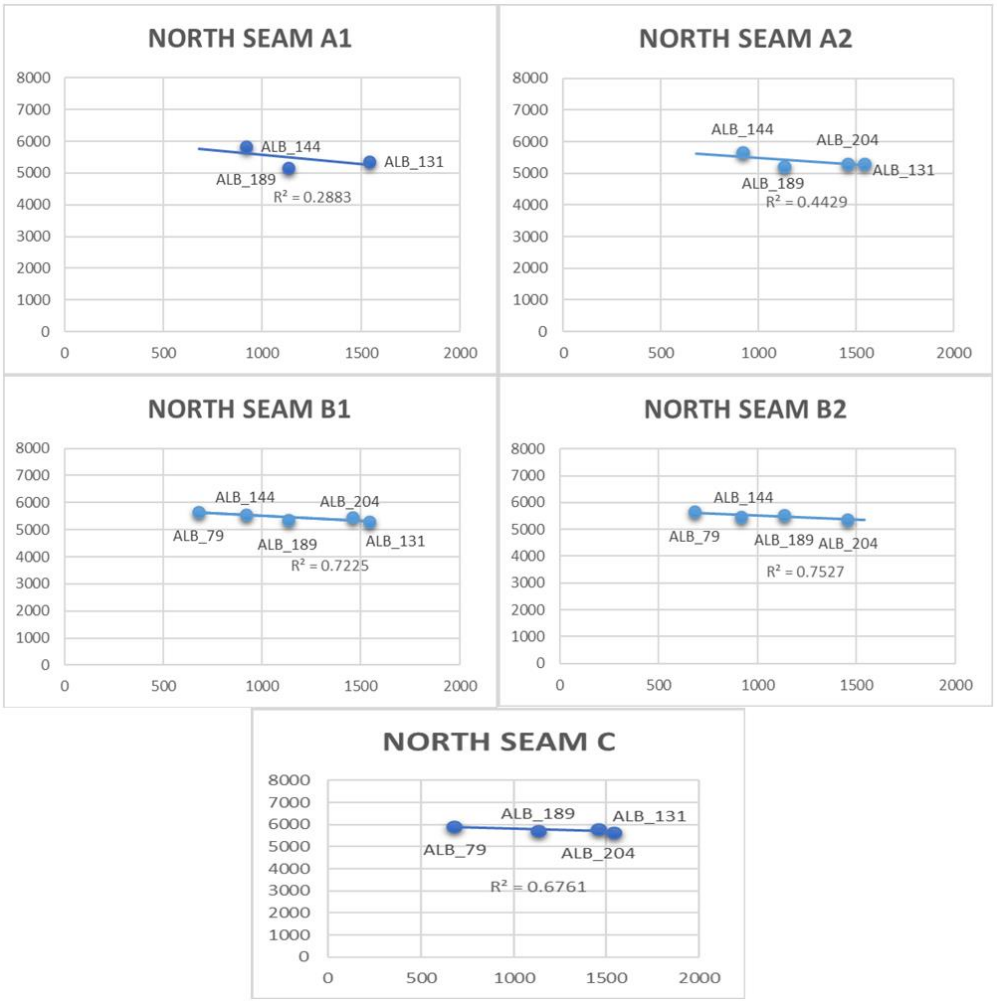

Figure 3: Change of Seam A1, A2, B1, B2, and C calories number due to increasing of distance to the North from intrution

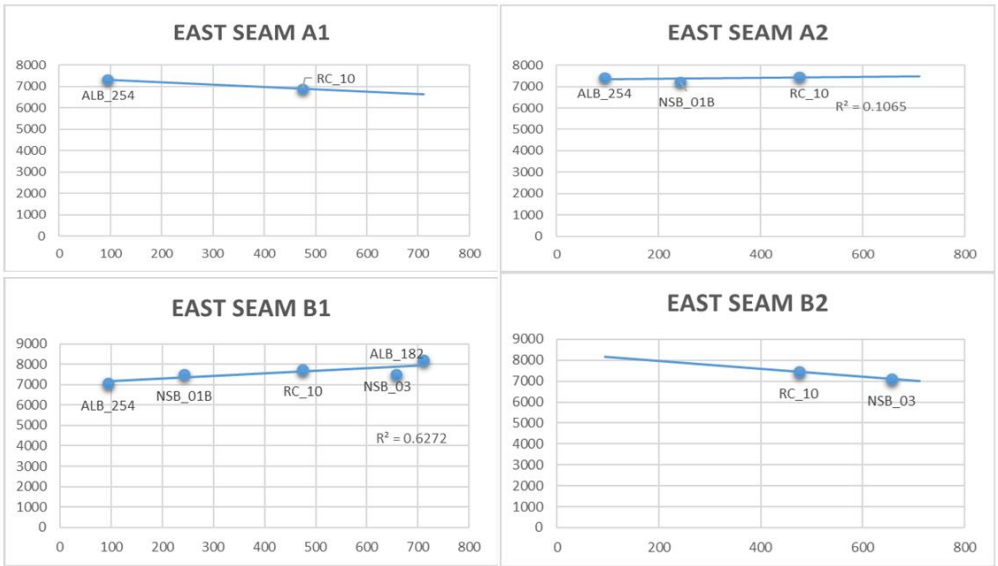

Figure 4: Calories number at A1 and B2 Seam in the different distance to the intrusion, and change of A2 and B1 Seam calorie value due to increasing of distance to the East from intrusion

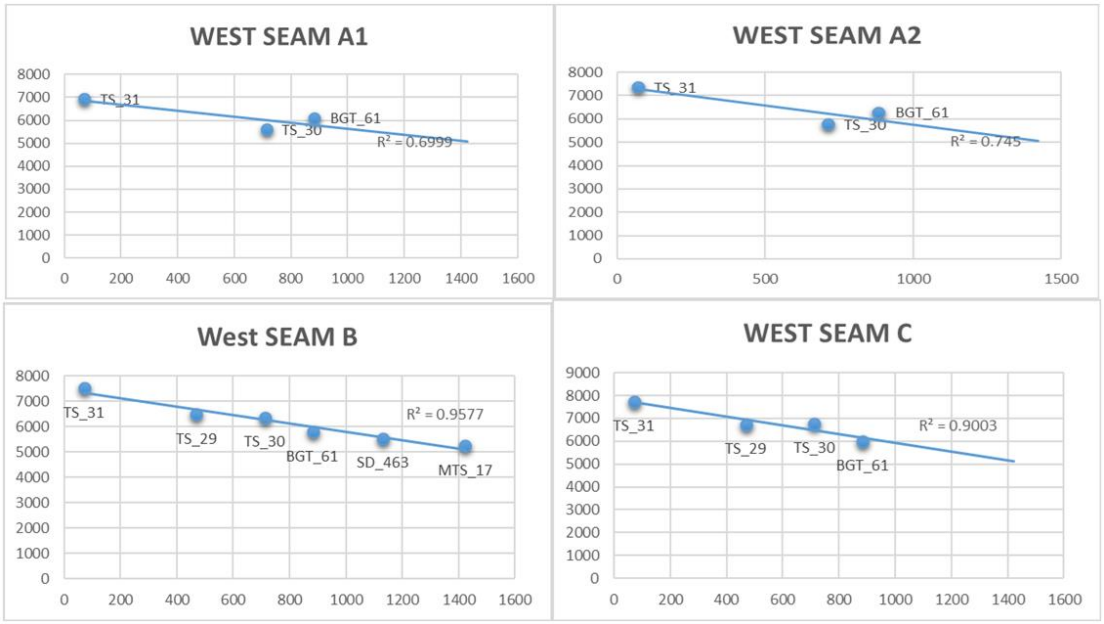

Figure 5: Change of A1, A2, B, and C Seam calories value due to increasing of distance to the West from intrusion

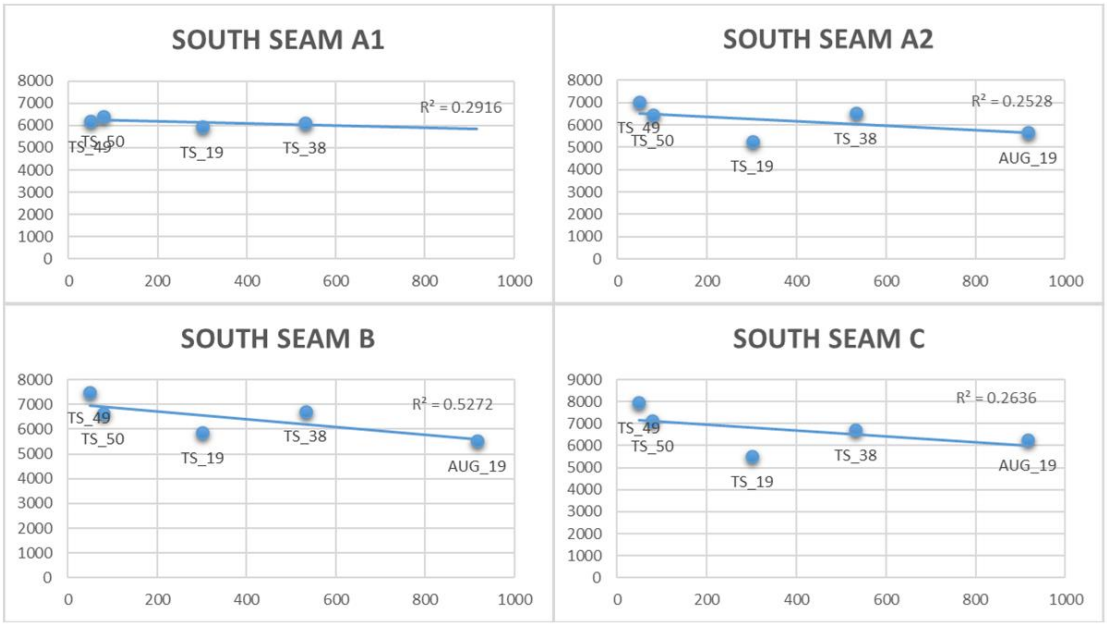

Figure 6: Change of A1, A2, B, and C Seam calori value due to increasing distance to the South from intrusion

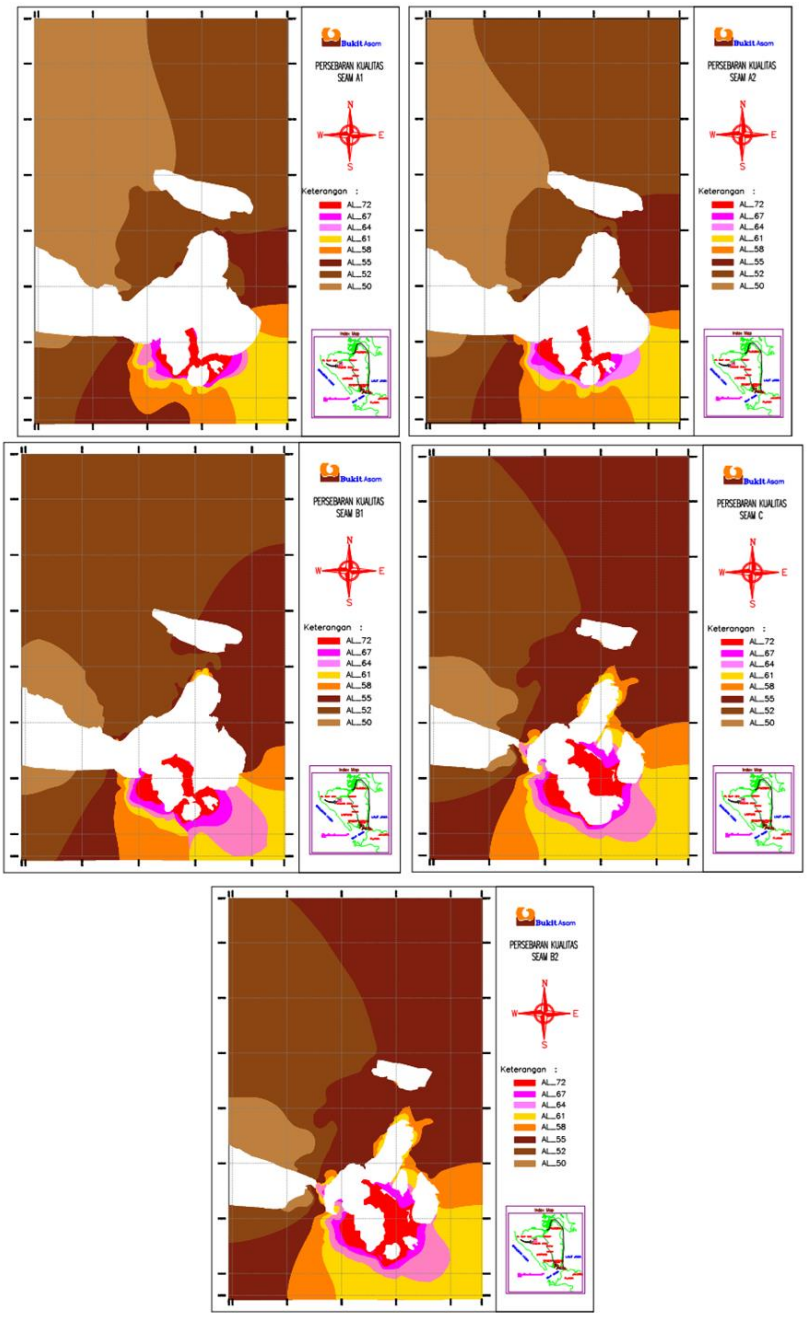

Figure 7: Coal Quality distribution of Seam A1, A2, B1, B2, and C model based on calorie number, showing that higher quality coal is located near intrusions. Red colour represents coal with 7200 kcal/kg, Light Brown colour represents 5000 kcal/kg coal

CONCLUSIONS

Based on field and data observations, it can be concluded that the field has five main seams with slight quality difference in vertical relationship but huge in lateral area. It is affected by the intrusion existening in the southern area of the field. Coal near intrusions has a higher quality rather than coal that is far from intrusion body. These coals also have difference in characteristics. They are brighter and more black yet brittle than coal without intrusion effects.

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