LEMIGAS BIOSTRATIGRAPHIC DATA BANK CONSTRUCTION

by
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ABSTRACT

In accordance with the tasks and functions of LEMIGAS, *the Stratigraphy Group of Exploration Division has been constructing a data bank of biostratigraphy which covers the whole areas of Indonesia. This project is financially supported by* LEMIGAS *and it has been started since 1997. The objective of this project is to collect biostratigraphic data across the Indonesian region. The data are differentiated into two types. The first type is raw data which were extracted from rock samples after laboratory preparation. The second type is data provided from the existing biostratigraphic charts. In addition, data generally derived from wells. Data obtained from the charts need to be re-analysed in order to gain accurate stratigraphic interpretation. The data bank is built by using a computer software called StrataBugs. This software was selected because it provides facilities to perform many types of biostratigraphic diagram which support different analyses. It is also compatible with other biostratigraphic software. The first five years were concentrated on western Indonesia. There are 285 data collected from various areas which consist of foraminifera, nannoplankton and palynology. Apparently, the number of data tends to increase each year.*

The data bank can be used for either scientific aims or managerial purposes. For scientific aims, these data are temporarily used for reconstructing biozones and palaeoenvironment. However, many analyses can be established by referring to these data such as palaeoclimate, sea level changes and palaeogeography. In fact, two papers have been published based on these data. For managerial purposes, these data may be used to evaluate the performance of Stratigraphy Group relating to commercial works because most data were supplied from service work. These data also support the management to prepare an appropriate strategy to achieve reasonable performance.

I. BACKGROUND OF THE PROJECT

Biostratigraphic analysis is a routine analysis within an exploration activity. It has been produced hundreds of data since the biostratigraphic method was applied in hydrocarbon exploration. Unfortunately, these data are spread out around the numerous oil companies and they are usually confidential. This situation causes difficulty in re-evaluating the stratigraphy of the prospect area due to the limited data from each one company. In order to eliminate the problem mentioned above, this project is proposed. With this project, it is expected to collect the existing biostratigraphic data. It is hoped that these data will help in interpreting the stratigraphy of new prospect areas or they will support the stratigraphic re-evaluation of the analysed areas.

Another consideration in proposing this project is the fast development of some methods in biostratigraphic analysis. In addition, modern biostratigraphic works require punctuality and accuracy in order to support active exploration. A biostratigraphic software called StrataBugs is selected to deal with this situation. It appears that this software is sufficient to be applied in this project. This software is well known and having some advantages such as a systematic storing of fossil and biostratigraphic data, and storing of geological data and its biostratigraphic analysis. Moreover, it can produce a complete diagram which displays a combination of

biostratigraphic and geological data at a time.

The data bank project is actually inspired by our involvement in the national research program, officially called *Riset Unggulan Terpadu* 1 (RUT-1) entitling the Tertiary Biostratigraphic Zonation of Indonesia. This research was held from 1993 to 1996. The zonations were constructed based on biostratigraphic data which were collected from various areas across the Indonesian region. Unfortunately, the RUT-1 did not cover the whole data because of time limitation. Therefore, this project is conducted to complete the previous RUT-1 results by collecting additional existing biostratigraphic data. This means that the main product of this project will be a data bank which covers the whole areas of Indonesia.

II. AIMS OF THE PROJECT

The main aim of this project is to collect biostratigraphic data in order to construct a data bank. Data may derive from wells and surface samples which consist of foraminifera, nannoplankton and palynology. It is expected that the data bank enables to provide suitable information for industry. It is also hoped that this data bank allows scientists to improve their biostratigraphic knowledge.

III. METHODS

The data mentioned within this paper are classified into two types. The first type is the existing biostratigraphic data which were produced by the service companies or oil companies. The second type is the raw data which were obtained from either well or surface samples. These two data types are treated differently as shown in Figure 1. For the first type, the existing data are input into the computer using StrataBugs software. For this purpose quantitative data are required. Therefore, the qualitative or semi-quantitative abundance must be converted into a quantitative abundance by interpreting qualitative symbols into numbers. This can be done by calculating the average value of the symbols. For example, a symbol of "common" abundance indicating the number of species ranging from 10 to 20 has an average value of 15. This number is then input into the computer representing "common" species. Figure 2 simply shows an example of inputting data. One must supply the user ID and password to log in this software. There are eight facilities within this software such as Wells, Samples, Taxa database, IGD, Charts, etc. (Figure 2). The item of Wells allows user to add the new wells or edit or delete the existing wells. The Sample facility enables to add, edit or delete the sample depth. This facility is also used to input the number of species. Taxa database relates to the fossil naming. In StrataBugs, diagram is constructed using Chart facility. In order to complete the diagram with other geological information such as lithostratigraphy, chronostratigraphy, zones, etc.,

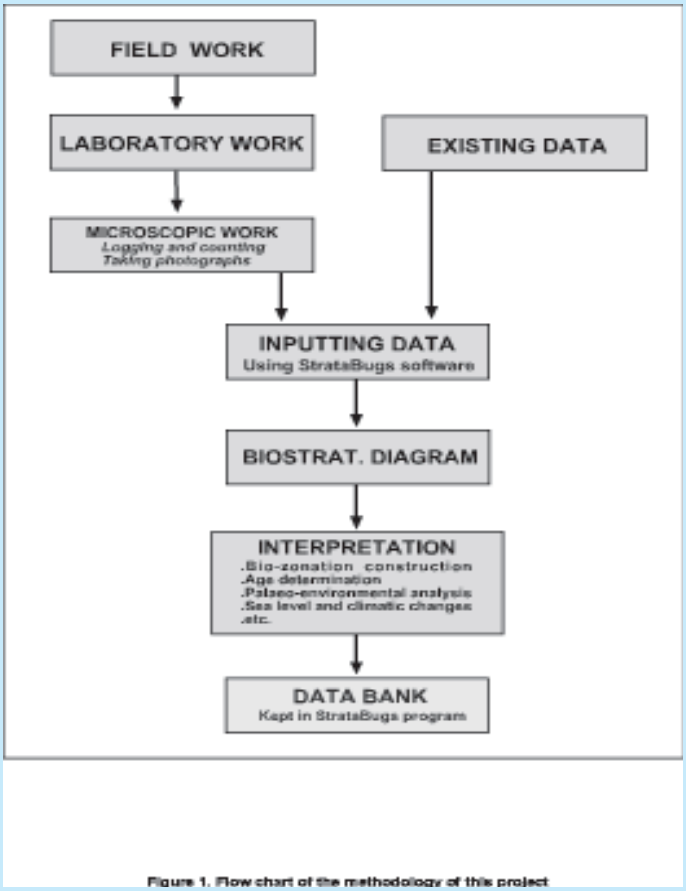

Figure 1
Flow chart of methodology of this project

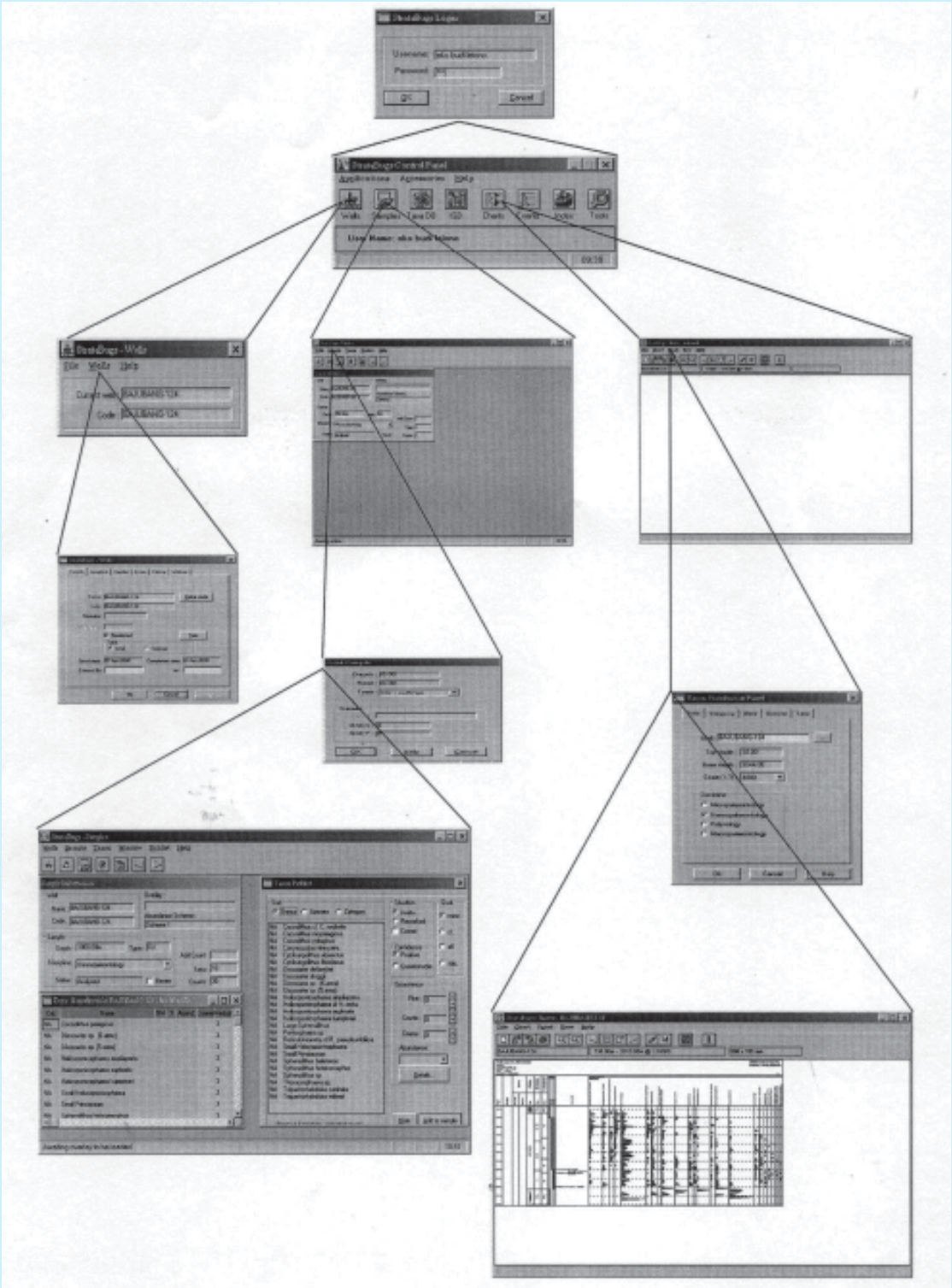

Figure 2
Flow chart of strata bugs procedure in constructing diagram

this software is equipped with IGD facility.

A biostratigraphic diagram is constructed after inputting the data which allows biostratigrapher re-interpret the biostratigraphic situation. The interpretations include many aspects such as biozonation reconstruction, age determination, palaeoenvironmental interpretation, sea level and climatic changes, etc. These aspects are recorded and attached within the diagrams and they are kept in the Strata Bugs program. The collection of the diagrams with their interpretations is called the biostratigraphic data bank.

The raw data have never been previously produced. These data are obtained from the samples which are collected from the wells or surface during field season. Samples are processed in the laboratory to extract fossils from the sediments. Fossils are displayed on the slides or plates. Microscopic work is intended to log and count the fossils. It is also done to take photographs of the existing fossils to build reference catalogue. The result of logging and counting of the species is input into the computer using Strata Bugs software (Figure 2). Following inputting the data, biostratigraphic diagrams are constructed and interpreted as conducted to the existing data (first data type). Finally, all diagrams are collected in a form so called the data bank.

Data can be assessed on the basis of certain selections such as well name and basin. Edition, addition and deletion are available to the existing data. The biostratigraphic diagram is usually recalled using well selection. This diagram can be corrected according to the new interpretations. This is quite useful because the addition of new data may result in the change of interpretation.

IV. DATA

There are 285 data which have been collected from various areas since the beginning of this project in 1997. These data consist of foraminifera, nannoplankton and palynology. Apparently, the number of data tends to increase each year as seen in Figure 3. The maximum number of data was achieved in 2001 which successfully collected 130 data consisting of 59 foraminiferal data, 35 nannoplankton data and 36 palynological data. Compared to year 2000, in 2001 the number of data input to the computer increased by 265 percent. Meanwhile, compared to the previous two or four years which only produced 20 data each year, the number of data collected in 2001 increased dramatically up to 650 percent (Figure 3). This fantastic achievement may indicate the significant improvement of the project's activity.

On the other hand, this phenomenon may reflect

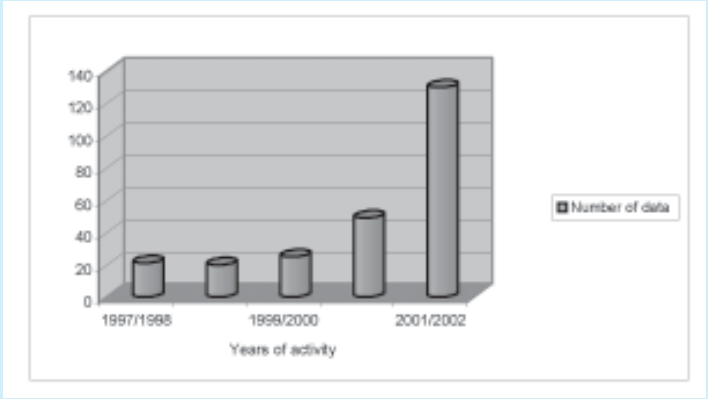

Figure 3
The number of data which was input during the period of 1997 to 2001 (taken from APLS report 2001)

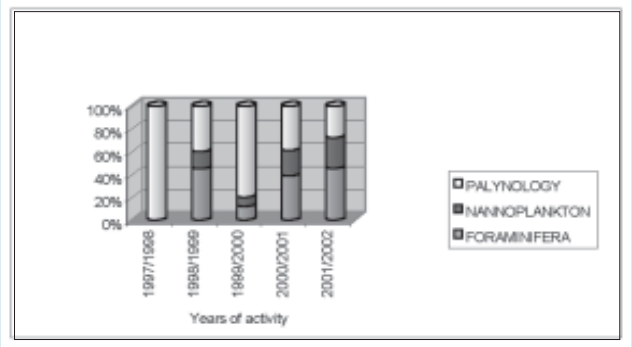

Figure 4
The type of data which was collected during the period of 1997 to 2001 (taken from APLS report 2001)

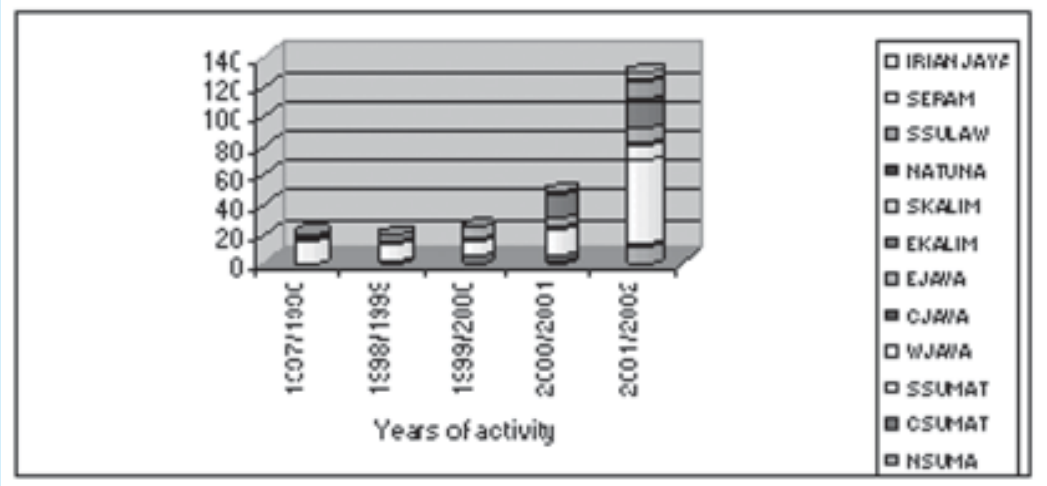

Figure 5
The number of basin which supplies data during the period of 1997 to 2001
(taken from APLS report 2001)

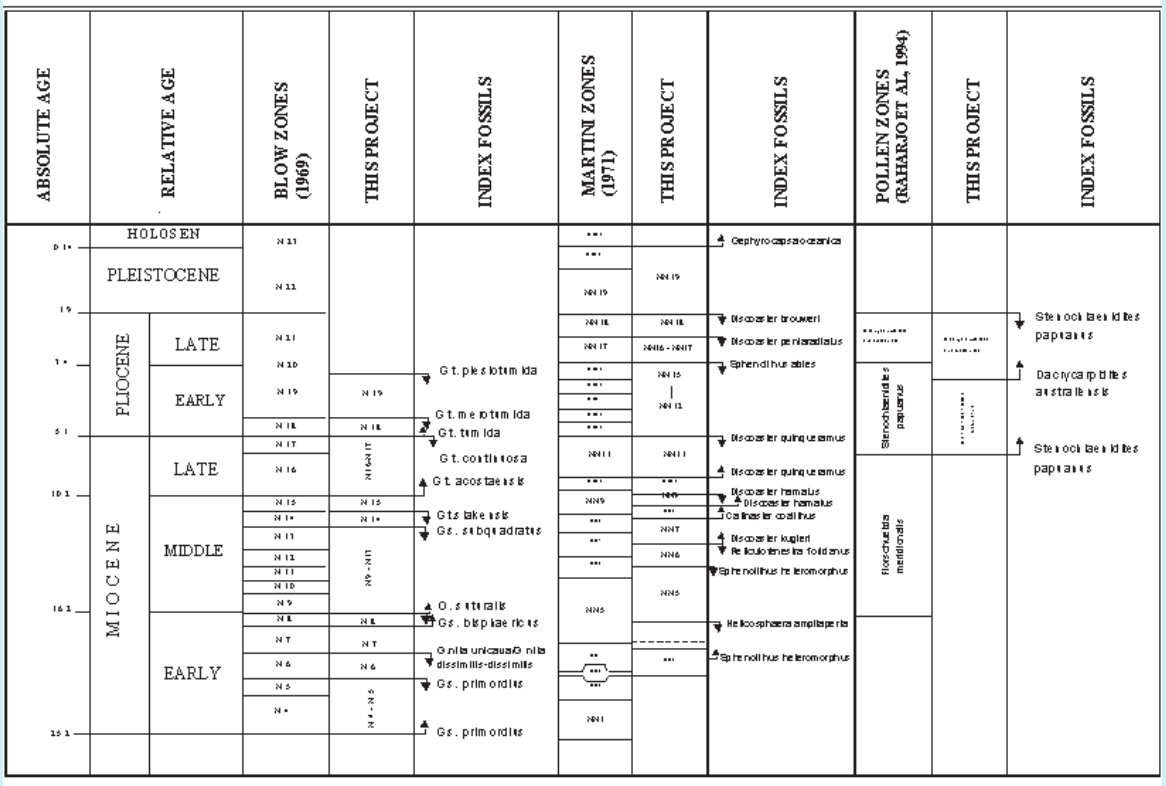

figure 6
Biozanation of the neogene sediment in the Northwet Java Basin

the increase of the commercial works provided by LEMIGAS exploration as most data derives from well samples which belong to oil companies. The commercial data are treated carefully due to their confidentiality. The type of data shows variation from year to year (Figure 4). If in 1997 all data were obtained from palynological analysis, in year 2001 they came from three different analyses. Figure 4 shows that since 1999 the foraminiferal analysis tends to increase, whilst palynological analysis decreases significantly. This situation must be taken into account by the management as palynological analysis earns the bigger income than that of other biostratigraphic analyses. One shall find the cause of depletion which results in lower income. Some actions must be taken to restore confidence in LEMIGAS by improving the quality of the analyses. Apparently, this project will help to increase the quality of the analysis by providing sufficient data collection which is useful as a reference.

The data are supplied from various areas or basins in Indonesia as shown in Figure 5. The number of basins supplying data for this project is increasing each year. In the early year of this project, data were collected from a limited number of basins. This might be caused by the familiarisation of the StrataBugs software. In fact, the first year was mostly spent for learning the operation procedure of this software. Figure 5 clearly shows that the highest number of basins occurs in 2001. This maximum number of basins relates to the success of the team in collecting old data. In addition, South Sumatra is a biggest supplier of data for this project. Apparently, requests for biostratigraphic analyses coming from this area increased significantly in 2001. By knowing this fact, some actions can be planned to expand LEMIGAS services in other basins.

So far 12 basins are covered in this project. Meanwhile, there are 60 basins in Indonesia. This means that this project has not represented basins across all Indonesian regions yet. Therefore, more time is required to allow data collection from all basins.

V. BIOZONATION

The biostratigraphic data bank assists the biostratigraphers to reconstruct biozonation. The biozonation can be used to designate the age of the sediments. It also allows correlation of wells or surface stratigraphic columns based on the appearance of index fossils. Although many interpretations can be gained from this data bank, this project mostly concentrates on reconstructing biozonation. In fact, two papers were published last year. One paper related to the climatic changes whilst another paper discussed the biostratigraphy. However, only basins located in western Indonesia have been interpreted for their zonations. Due to spacing problem, only a selected zonation is presented within this paper. Figure 6 shows an example of biozonation of the Neogene sediments in the Northwest Java Basin. This zonation has not completed yet, therefore more efforts are needed to finalise it. The zones are reconstructed based on well data which penetrated the Neogene sediments in this basin. Some new zones agree but the others disagree with the previous zones proposed by other authors. The disagreement may be caused by the local variation of the index fossils.

VI. CONCLUSION

As a research institution in oil business, LEMIGAS ideally needs to have a data centre for supporting its activities. The data bank of biostratigraphy is a program in Stratigraphy Group of Exploration Division which allows realisation of this idea. The data collection helps stratigraphers to produce better interpretations because it can be used as a reliable source. This data can improve their biostratigraphic knowledge. This immediately increases LEMIGAS confidence in providing commercial services. In addition, the data bank also supports the management in evaluating previous activities which especially relate to the service works. It can be used to prepare the appropriate strategy for expanding the services.

A total of 285 data have been collected from 12 different basins since the beginning of this project in 1997. These data comprise foraminiferal, nannoplankton and palynological analyses. Apparently, the number of data tends to increase every year. South Sumatra is the biggest supplier for this project. Considering the total number of basins in Indonesia (60 basins), the data obtained within this project does not represent the whole basins obviously. Therefore, more time is still needed to construct a decent data bank of biostratigraphy.

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