



Development of a Software for Well site using Visual Basic 6.0

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Summary

An attempt had been made to develop an application software to help a wellsite geologist enabling him with more accuracy and power in his activities, even in the absence of a Mud Logging Unit. The software had been written in Visual Basic 6.0 with graphics programming and consists of five component modules that can be used effectively to plot a masterlog, a location map, a structural correlation chart, a stratigraphic litho-correlation and a well header. The masterlog component can be used to plot the ROP, Lithology, Interpretative lithology, H/C shows and Drilling Parameters and has a much better output than that of a paper masterlog with better accuracy and lesser effort. The Mapping module gives the wellsite geologist a tool to plot nearby correlative wells in both 1:20,000 and a 1:50,000 scale with an estimate of the distance between nearby wells. Additional data can be incorporated in the maps and the wells categorized as per their status. The Structural Correlation module takes care of the structural correlation where a maximum of three wells can be correlated with the input of their formation tops only from any MSL depth, the scale being calculated by the system. Similarly the Stratigraphic Correlation module can plot the lithostratigraphy of three wells and correlate them based on inputs, the scale being calculated by the system. The Header module is used to devise a well header for all the above four modules. All these applications are developed with a very easy graphic user interface and are much faster than when done manually. The basic principle of this application involves defining an initial graphic in a picture box and then scaling of the graphic as per the input values using the Paintpicture method of Visual Basic 6.0 or Bitblt API functions. All the outputs of this application are saved in image formats for later use and can be edited using image editing tools. Additionally all these modules can be run from a single master form and from a normal PC without any need of a high end workstation.

Introduction

The installation of computers in the well-site geology laboratories had facilitated the well-site geologists with more powerful capabilities of analysis, accuracy and control over his well site operations, even when a mud logging unit is not available. A lot of softwares are available, suited for different module of operations that can be used by a geologist in a well site. An effort had been made to develop one such software using Visual Basic 6.0 tailor made to suit the operations of ONGC- that can effectively plot a masterlog, a location map in both 1:20.000 and 1: 50,000 scale, a structural correlation chart, a stratigraphic litho-correlation and a header for all the three above.

Principle

The basic principle behind this software involves a predefined graphic in the picture box of a Visual Basic form. This graphic is then scaled in proportion as per the values input by user mainly by using the

Paintpicture method of Visual Basic 6.0 or Bitblt API functions. This scaled graphics constitute the information to be displayed and is ultimately saved as a .bmp file for later use.

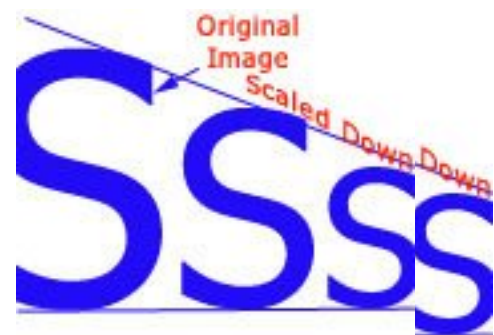


Fig 1: Principle: Original predefined graphic scaled down using the Paintpicture method of Visual Basic 6.0 or Bitblt API functions as per the input



a) Masterlog module

The Masterlog module of this software uses graphics programming and control array modules of Visual Basic. It has the capacity to plot depth, corresponding ROP, lithology, interpretative lithology and its description, H/C shows and remarks if any. Although it follows the same proforma as in paper masterlog, this digital version is much less time consuming, less tedious and much simple than the above. The user interface had been designed in a form-type way but is very much self explanatory that makes it a lot user friendly for geologists during their data input. It also has the same scale as a 1:500 electrolog or a paper masterlog and can be readily used for correlation purposes. At a time a total stretch of 70m to 95m of masterlog can be plotted based on the resolution and size of the PC monitor. The lithology is represented as per standard symbolic representation. However, the ROP here can be represented up to a maximum value of 100 and that too in a linear scale as compared to that of a log scale in a hand drawn masterlog. The only disadvantage suffered by this module is that the output cannot be directly saved into a document form, but has to be captured using the CAPTURE button and then saved as an image form for thereafter printing and editing as per requirement.

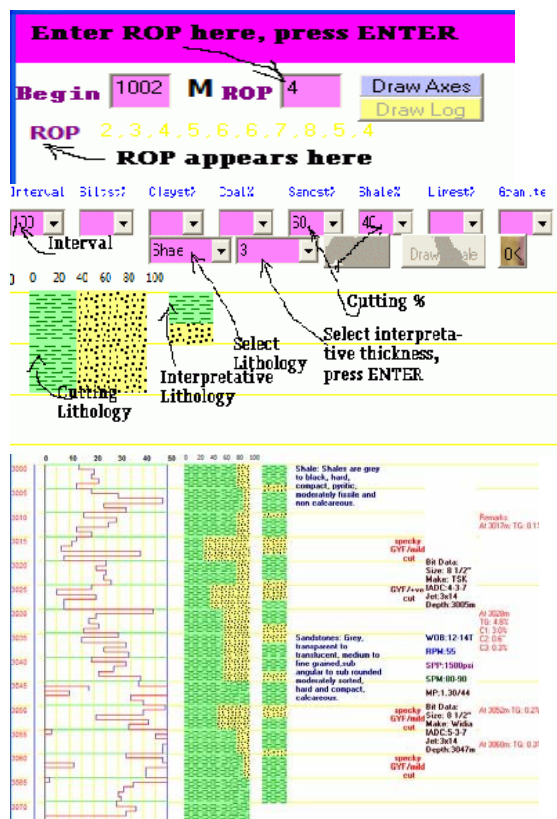


Fig 2(a): Performa of entering depth, ROP, lithology and data in the masterlog (b) Final output of a masterlog module

This masterlog module uses predefined images signifying different lithologies which are extracted in proper proportion using the values fed in the form and plotted using the Paintpicture commands of Visual Basic. The ROP plot uses the Line methods of graphics drawing values from an array. The labels signifying drilling and lithology details uses a control array.

b) Map Module

The Map module also uses control array programming and *Paintpicture* methods of graphics programming of Visual Basic to develop the location map of an area. This can plot it in two scales of 1:50,000 and 1:20,000 which are most frequently used in ONGC. The whole concept is based on the linear distance between latitudinal and longitudinal lines in a toposheet, converting them into equivalent pixels in accordance with the resolution of the PC-monitor. The basic inputs required here are the longitudinal and latitudinal co-ordinates of the well/location, the status of the well/location (dry well, released location etc), the scale of the map, the name of the location and a reference co-ordinate w.r.t. which the above points are plotted. The 50000 scale map can plot all points that fall within a max range of 5' of longitude and 3' of latitude whereas the 20000 scale can plot points within 2' longitude and 2' latitude. A proper indexing is followed categorizing the plotted points as oil wells, dry wells, released locations etc. which gives an idea of the status of the point plotted. Added to that, it can also give an estimate about the approximate distance between two points plotted in meters. Along with the plotted points, provisions for adding significant details of them such as important formation depths or target depths are also available and can be plotted along side the points. The entire thing can be saved directly as .bmp file and a printout taken as per requirement. Though the output of this module is not precisely accurate, an idea about the disposition of the wells can be achieved for correlation and presentation purposes. The major disadvantage here is no projection procedure is used in plotting of these points/locations and the plotting is essentially linear. Hence though the margin of error is low for small distances, it magnifies when long distances are to be plotted. Provisions for drawing and making notes are also available in this module.



formations are correlated, the thickness calculated and tag lines drawn using the *Line* method

This attempts in structural correlation of up to 3 wells from any MSL depth provided by the user. The input here is the formation depths of the different wells in meters as well as the ultimate depth up to which the correlation is supposed to extend and the MSL depth from which the correlation initiates. The system automatically computes a scale based on this ultimate depth and plots the correlation in accordance defining similar colours for correlatable formation and then joining them by tag lines. This whole correlation can again be saved directly from this module as a .bmp file. The disadvantage of this module as such is that it can correlate maximum upto 3 wells

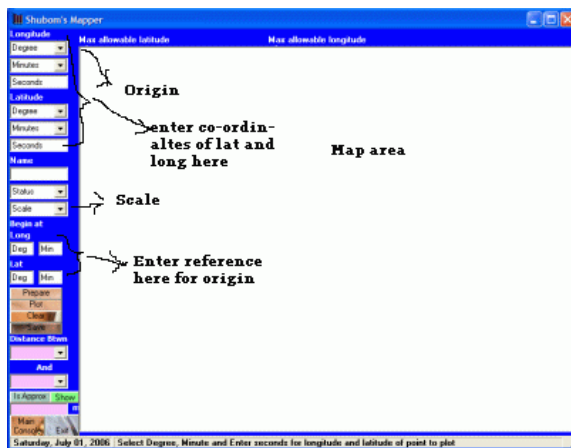


Fig 3(a): Interface for plotting of the map, graphic and user friendly

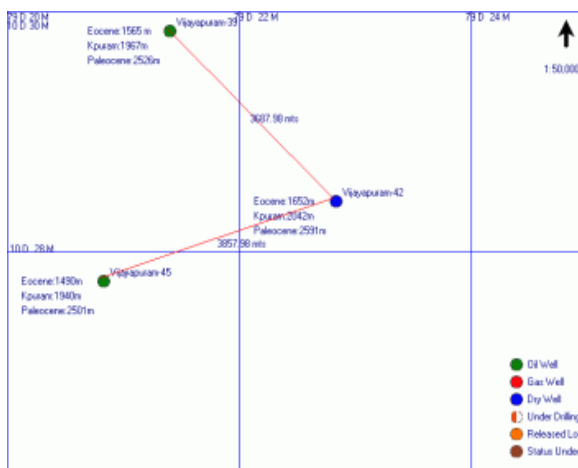


Fig 3(b): Output of the map module showing wells and the distance between them

In this module CurrentX and CurrentY commands are used to calculate the position of different points from an array of the user entered values as per the required scale. The symbols signifying the status of the different points plotted are then copied from a few predefined images as above and then plotted at the CurrentX and CurrentY positions.

c) Structural Correlation Module

This module for structural correlation has also been developed of graphics programming and is principally based in the same concept as the above modules. The scale of the correlation is calculated as per the depth of the deepest well depending upon the resolution of the PC monitor. The thicknesses are calculated based on the depth entered and then converted to equivalent scale and plotted using the *paintpicture* methods. The names of the formations are stored in three different arrays of their corresponding wells and if they match the

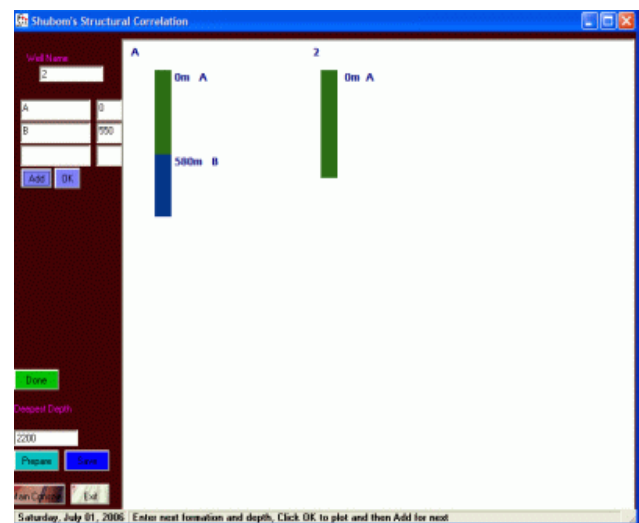


Fig 4(a): Interface for entering data for structural correlation

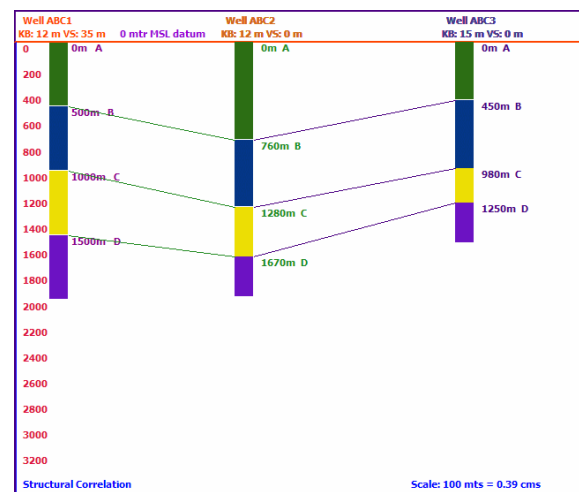


Fig 4(b): Output of the structural correlation module

d) Stratigraphic Correlation Module

This stratigraphic correlation module to is based on the same lines as that of the structural correlation



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module but is more extensive. The formation names are stored in arrays, matched and if found correlatable are joined by tag lines. Thicknesses are calculated based on input depths and plotted from predefined images using the *Paintpicture* methods.

The inputs here are the ultimate depth of correlation, the formation top from where the correlation is to be hung and the depth of the formation tops. However in this case an additional advantage of plotting the broad lithostratigraphy of the wells had been added and also provisions are there for adding a correlatable marker for all the three wells. Here too the system calculates the scale and saves the correlation as a .bmp file.

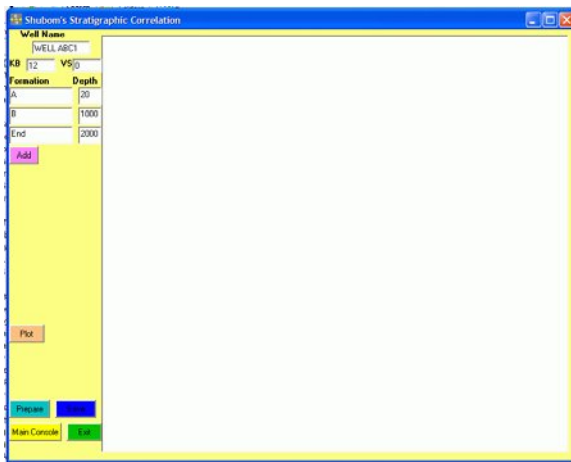


Fig 5(a) Performa of entering data in the stratigraphic correlation

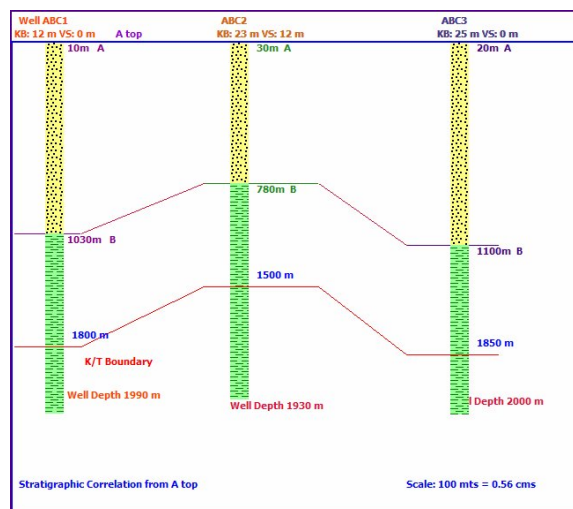


Fig 5(b) Final output of the stratigraphic correlation module

This is by far the simplest of all the modules where by a header can be a made for a particular well to attach along with the outputs of the above modules. The basic inputs in these are the general well data as are available in the well completion reports. This again suffers from the disadvantage of not being able to be saved directly from the module but has to be saved using

Capture button as an image file. The Capture button copies the form to the Clipboard in the form of an image similar to the function of an Printscreen key and forms an image in a .bmp format.

Well		WELL ABC1	
Rig	E-760-X	Date Spudded	11.08.2004
Sub Basin	Borholla	Date TD	16.11.2004
Field/Prospect	Borholla	Date of Hermetical	19.11.2004
Latitude	11 ° 24 ' 55.3 "	Date of Rig Release	19.12.2004
Longitude	28 ° 12 ' 44.5 "	Target Depth	3100 m
Elevation Data		Drilled Depth	3093 m
GL	90 m	Well Category	Exploratory
KB	120 m	Objective	Paleocene prospects
		Well Status	Oil Well

Fig 6(b). Output of the header module.

The header image generated can be stitched on to the output of any different module using a Masterlog Joiner module. The image of the required portion of the masterlog to be stitched is chosen from a drive box and clicked to join with . The position of adding of the clicked masterlog image to the previous portion on screen is based on the scale calculated as per resolution using the Picture Height commands. It calculates the height of the masterlog image to be loaded and then uses the Paintpicture mode to plot it and saves it as a bmp using the Savepicture command. However stitching of multiple images of .bmp format makes it heavy in size

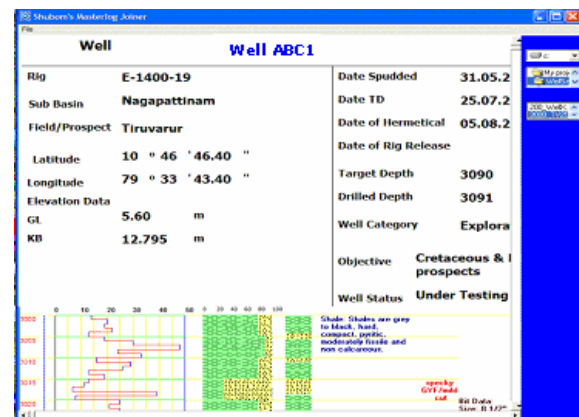


Fig 7 (a). Layout of Performa for attaching portions of masterlog



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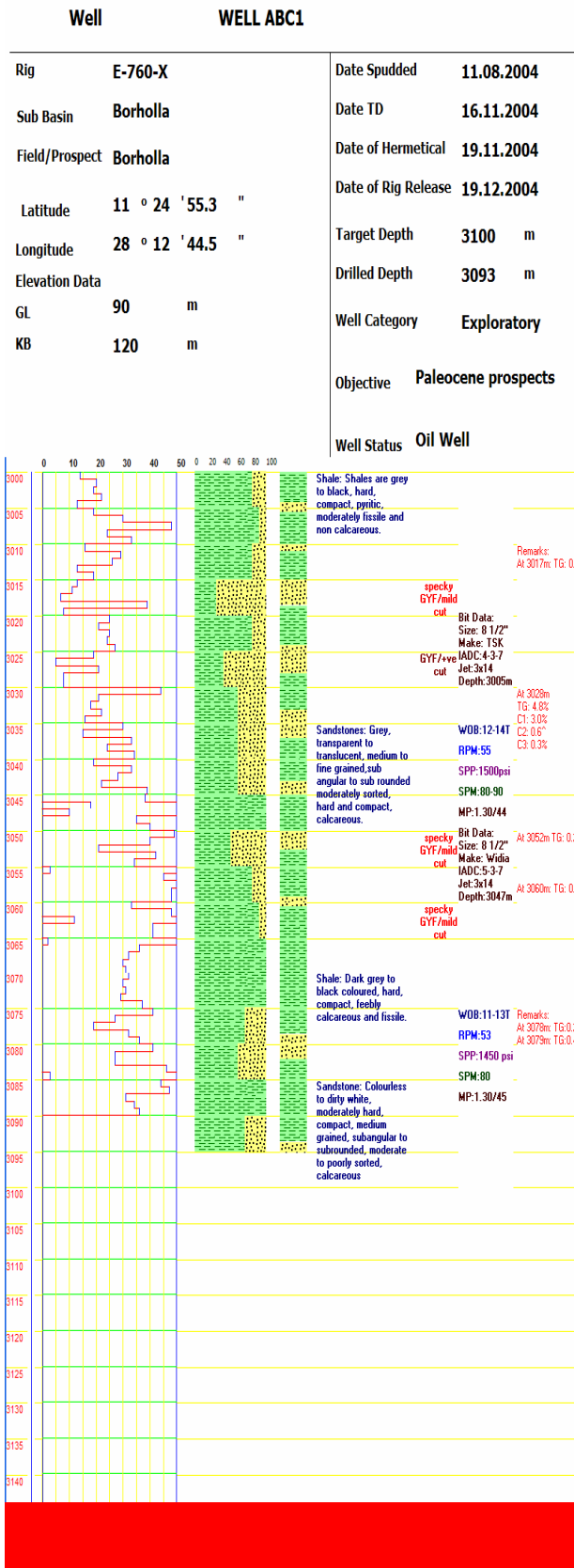


Fig 7 (b) Final Output of the masterlog with header

Conclusions

The above five modules though can be used effectively in well sites and base offices are just ideas on which further advanced work can be carried upon. All these modules can be run from a single start up form in any PC. It can be used independently from a desktop of any windows pc without depending on any other application. Proper validation methods validate the data while entering them. The disadvantages of this software can be rectified on further work. The mapping part can be improved for developing a further by a back end database to the form which stores the map data converting this module into a further informative GIS type map. The masterlog module may be improved by adding data from an electrolog along side this drilling data to design a composite log. The same program can be modified to devise the litholog of a well. Another advantage of this application is that, it can be run This software can also be further developed to integrate data from well site and bring them in the same platform for use in different workstation softwares. However a lot of scope lies in the further development of this program to suit other aspects of well site and base office operations.

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