ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

An ISO 3297: 2007 Certified Organization *Volume 5, Special Issue 1, March 2016*

National Conference on Recent Trends in Electronics and Instrumentation Engineering (NCRTE 2K16)

1st& 2nd March 2016

Organized by

Department of Electronics &Instrumentation Engineering, Adhiyamaan College of Engineering, Hosur, Tamilnadu, India

Automation of Driller Machine using PLC

C.Stalin Jose [1], M.Nikitha[2], S.Palani[2], P.Vennila[2], M.Vivekanandhan[2]

Assistant Professor, Department of EIE, Adhiyamaan College of Engineering, Hosur, Tamil Nadu, India[1]

UG Student, Department of EIE, Adhiyamaan College of Engineering, Hosur, Tamil Nadu, India[2]

ABSTRACT: The PLC based machine data and status monitoring system uses the principle of controlling any process (driller machine)that requires monitoring the status of the process in the field and providing the results in a display form. The numerical or statistical status of the process will be sent through control panel to the I/O terminals of the PLC. The content from the control panel is converted into data according to the parameters provided through the PLC programming in the form of ladder logic. WPLSoft is generally used to monitor the set value or temporarily saved values in timer, counter and register and force on/off of output contacts. For the purpose of displaying the status on PC, HMI, which is a visualisation software is used and PLC is interfaced using RS232 cable.

KEYWORDS: *Rig Driller machine, Delta-make PLC, HMI Software*

I. INTRODUCTION

One of the primary functions of PLC(Programmable Logic Controllers) is to automate an electromechanical process likeconveyor belt operated machineries,bottle filling process,light fixtures etc.It is a sophisticated computer that can have many number of inputs and outputs,either in analog or digital form according to the manufacturing company and its configurations made by them.Cost of PLCs vary according to their control span and the speed at which they must process signals and data.When designing PLCs,very specific ICs are to be used in order to meet the required specifications.For selecting ICs for use in a PLC design,resilience,speed,accuracy and power consumption are the key factors to be seen.Range of inputs of analog PLCs may vary from millivolts to tens of volts; milliamps to amps;Output signals control power devices like actuators,motors and relays.Decisions are made based on the logical states that are taken by the execution of sequencial programming that is given in the ladder logic form,Instruction list or functional Block Diagrams or sequential function chart or structured text.Output switches are turned on or off according to the program,which in turn is effected by the input signal conditions.This is how PLC is automated without human intervention.A PLC is an example of a hard real-time system which means the execution takes place within a limited time period.Scan time of a PLC may vary from few milliseconds for a smaller program on a fast processor to nearly 100 milliseconds for a larger programs running slowly.Expansions for inputs and outputs are available in case of insufficient I/O.

In this paper, it proposes efficient recording of the data that is taken from the rig driller machine field site. Secondly the recorded data can be stored and retrieved whenever required. It uses HMI Software,which is a screen editor for displaying the data like that of start time of drilling,loading and unloading timings,stop time and indicators for these signals along with a proximity sensor indication in case of an interruption by any other external objects like human body parts in order to avoid faults occurences and accidents.For communicating PLC with field devices,RS232 cable is used,which is in-built in Delta-make PLC(WPLSoft 2.41) that can be downloaded for free from internet and is easily available.RS-232 is used for the communication between PLC and PC(installed with HMI Software in it) possible.HMI is a one-stop Visualisation Software that includes visualisation tasks close to machines on a PC-based multi-user systems.

II. SYSTEM MODEL

The Hardware Kit consists of MCB,Delta-make PLC,SMPS,Relay Circuit and I/O Connectors that are mounted on the board and is connected using wires with name tags for easier identification of signals that are given as inputs and those taken out as outputs.These components have its own unique usage according to its structure and short circuit and

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

An ISO 3297: 2007 Certified Organization *Volume 5, Special Issue 1, March 2016*

National Conference on Recent Trends in Electronics and Instrumentation Engineering (NCRTE 2K16)

1st& 2nd March 2016

Organized by

Department of Electronics &Instrumentation Engineering, Adhiyamaan College of Engineering, Hosur, Tamilnadu, India

overcurrent fault conditions.This is an additional circuit that is included mainly for the safe and smooth operation of the entire system.

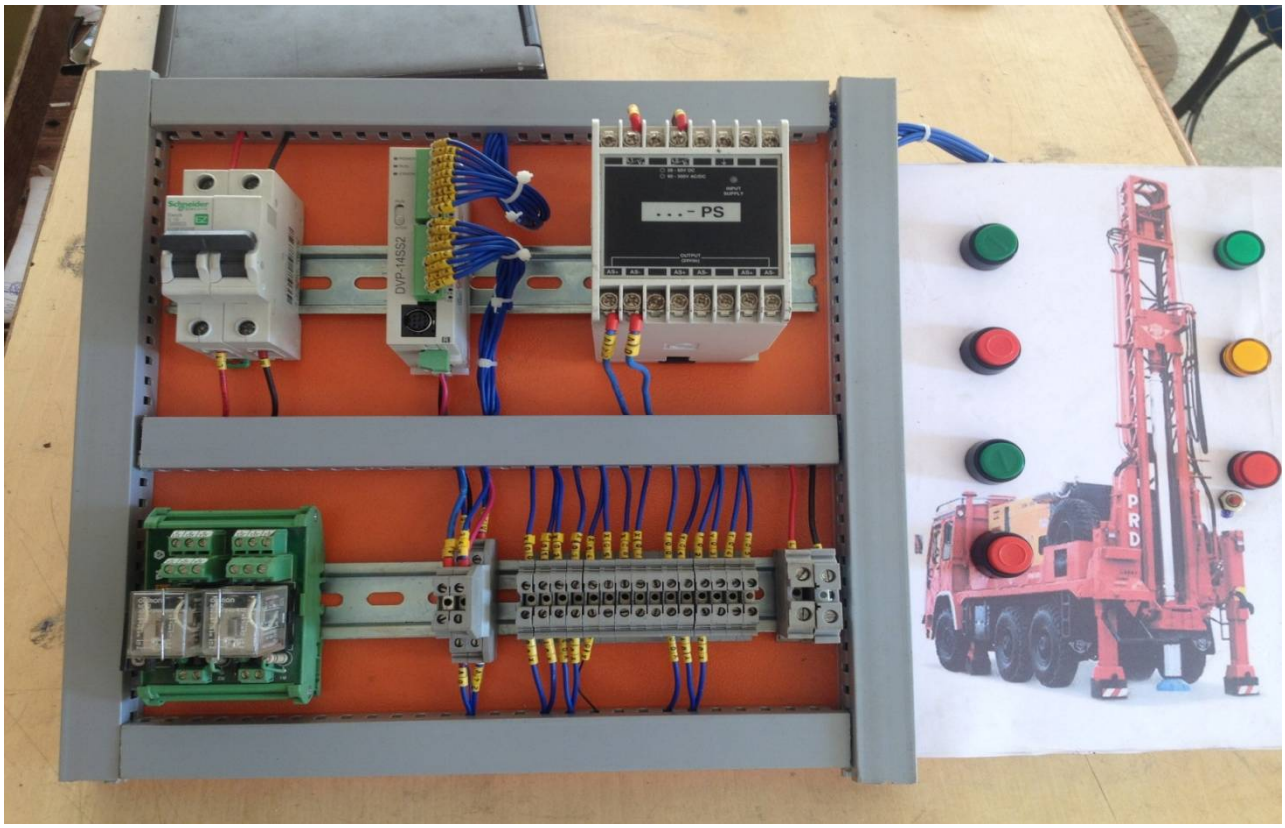

Fig 1.Hardware Kit

SMPS is another mportant circuit that is used for efficiently and effectively to convert the given power supply of 220Vac to 24 Vdc that is feedable to PLC.Whenever the entire system is stopped because of proximity sensor indication,the PLC is again turned on by using the output 24V that is given through the output wire of proximity sensor.SMPS is often referred to as switched mode converters or switchers as its function implies.Relay circuit is mainly used in order to avoid the effect of any fault at field level.Because of the presence of the relay circuit,switching takes place during any occurrence of fault in PLC device.This is efficiently used for the purpose of safeguarding the PLC.I/O Connectors are used which acts as an intermediatary screening unit between field site and the PLC programming device.This unit consists of 8 input terminals and 6 output terminals which varies according to the type of PLC used and its I/O Configuration.

III. HARDWARE SPECIFICATIONS

Devices that are mounted along with PLC has its own specification and ranges to function accordingly when the input is applied.Few devices like MCB,SMPS are used based on the overall power supply usage of the system.PLC used is of series DVP14SS00R2.Electrical specification of PLC includes 24Vdc input which is obtained from 100-240 Vac.Inrush current is at a maximum of 7.5A for 24 Vdc.Fuse Capacity is of 1.85A for a maximum 30 Vdc.Power protection is provided with counter-connection protection on the polarity of DC input power.Operating Temperature ranges from 0 to 55 degrees and humidity of 50~95%.Input impedance is of the range of 4.7 KΩ .Maximum frequency on which it can operate is 20kHz.Input is of the DC(source or sink)type.Output is of Relay type.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

An ISO 3297: 2007 Certified Organization *Volume 5, Special Issue 1, March 2016*

National Conference on Recent Trends in Electronics and Instrumentation Engineering (NCRTE 2K16)

1st& 2nd March 2016

Organized by

Department of Electronics &Instrumentation Engineering, Adhiyamaan College of Engineering, Hosur, Tamilnadu, India

IV. SECURITY

PLC based data monitoring system is secure in usage,especially in the measurement of the data of a rig driller machine which is usually located at a remote site.Earlier,when there was no access of PLC to be used for recording purpose,the amount of depth of how much is drilled would be calculated approximately by the rig driller employee which may or may not be correct and accurateas it was interpreted manually.As a result of this insecurity,recording and storage utility in addition to the basic function of PLC in monitoring and controlling has been implemented through this paper.

This enhances safety and reduces the possibility of being cheated due to misreading about the depth of the rod drilled into the Earth's crust.Another major advantage in using this type of automation for data monitoring and controlling is the facility of retrieving data whenever needed or for any future references.

In addition to recording and storage of the data from the driller machine field site,recent technology lik GSM can be used to get the output information regarding the driller machine field site through mobile alerts by tracking the location even when the location is at far remote area.For positioning purpose,GPS (Geo Positioning Syastem) can also be included in the system.According to the requirements,the additional components can be included to the system.
There is a high possibility of misusing the site records,fuel consumption and the depth to be drilled by the drilling rig operator.This frequent mistakes can be effectively avoided by this error-free method.

V. RESULT AND DISCUSSION

In the fig 2, it shows the display unit that has been generated by the HMI Software which is a screen editor of version V.05.86 that shows the digital view of the data that is being recorded.

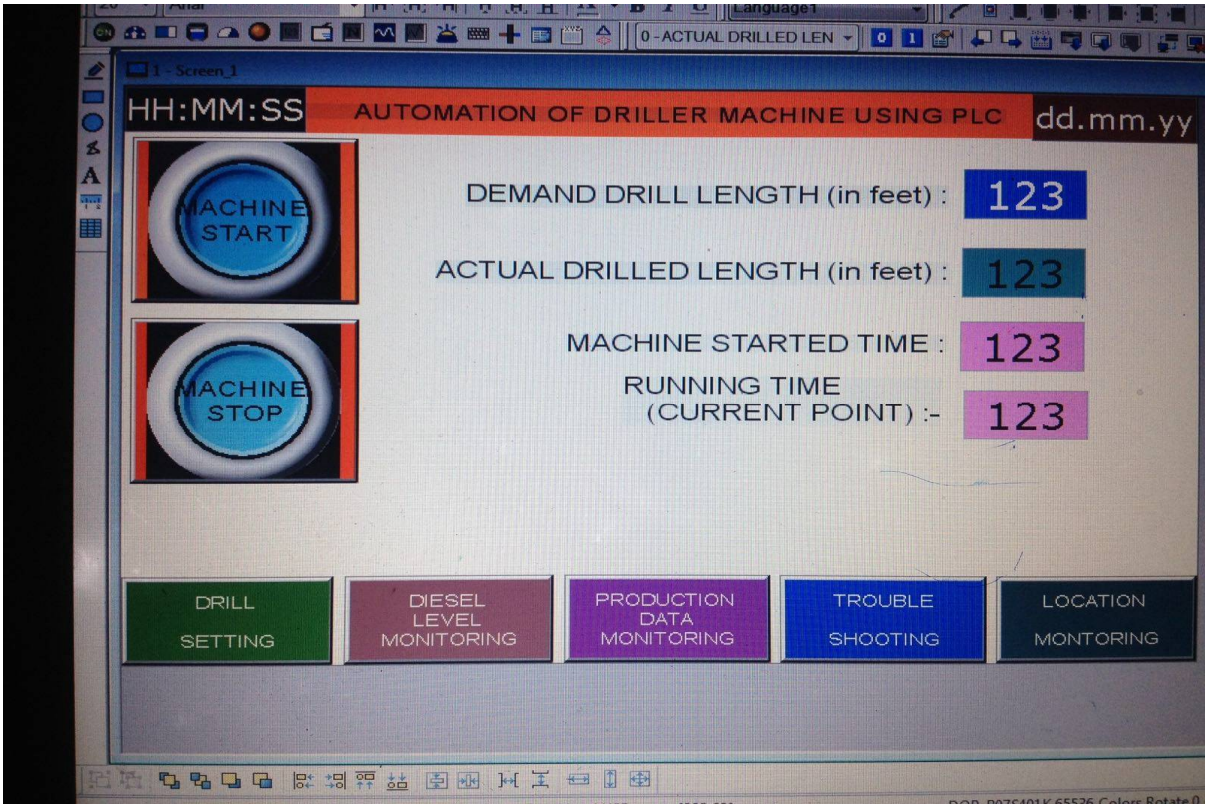

Fig. 2 Display unit

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

An ISO 3297: 2007 Certified Organization *Volume 5, Special Issue 1, March 2016*

National Conference on Recent Trends in Electronics and Instrumentation Engineering (NCRTE 2K16)

1st & 2nd March 2016

Organized by

Department of Electronics &Instrumentation Engineering, Adhiyamaan College of Engineering, Hosur, Tamilnadu, India

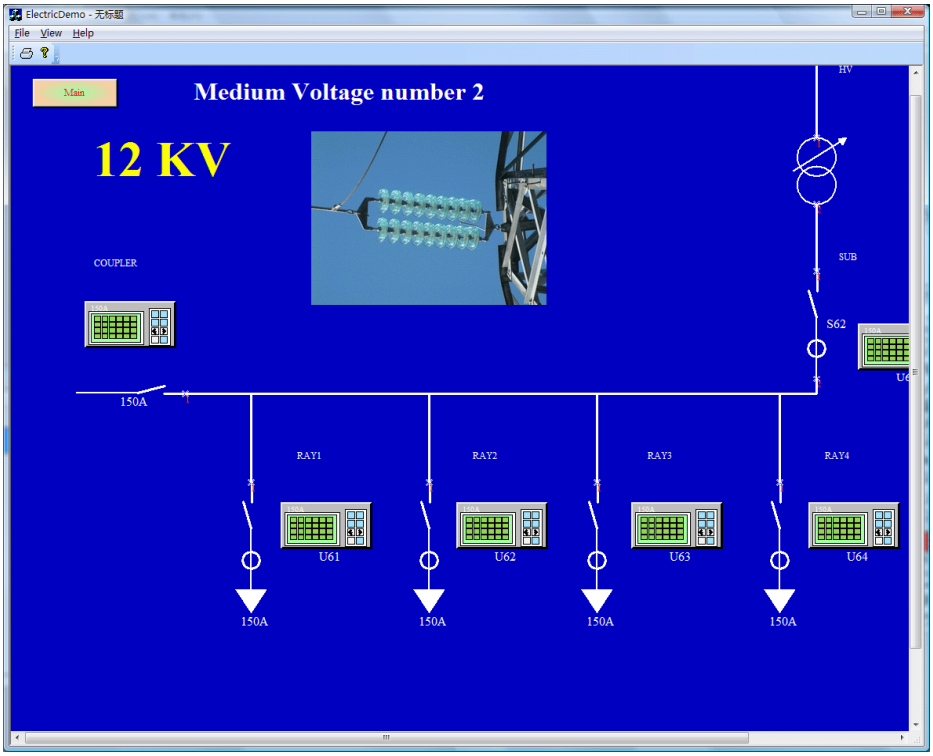

Fig. 3General View of HMI Software

In the fig 3, it shows the general view of HMI Software that shows the signals that is used as input and output as graphical representation like that of SCADA

Fig .4Typical HMI Interface

In Fig 4, Typical view of the HMI Interface unit is shown.This view consists of emergency stop button,unlock button,functional buttons,various modes to which it can be switched,chip conveyor that represents the action that is to be performed at that instant by the system,Handle buttons that is used to adjust the ranges according to the requirement which depenmds on the type of data recorded for displaying purpose.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

An ISO 3297: 2007 Certified Organization *Volume 5, Special Issue 1, March 2016*

National Conference on Recent Trends in Electronics and Instrumentation Engineering (NCRTE 2K16)

1st& 2nd March 2016

Organized by

Department of Electronics &Instrumentation Engineering, Adhiyamaan College of Engineering, Hosur, Tamilnadu, India

VI. CONCLUSION

Thus it allows to collect the data like start time,end time,loading and unloading indications,proximity sensor indication through PLC from the rig driller machine field site.Then this collected data can be recorded simultaneously along with controlling and monitoring the process using PC that is installed with HMI Software,which is especially used for display purpose.This recorded data that is which stored in PC can be retrieved at any needed instant.

REFERENCES

1. Programmable Logic Controllers by Frank.D.Petruzella Fourth Edition ,Tata MC Graw Hill, New Delhi.
2. Programmable Logic Controllers: Principles and applications,4th edition, upper saddle River, Ph, 1999.
3. Websites: http://www.plcs.net
4. http://www.delta.com.tw/product/em/control/plc/download/manual/DVP-SS2_I_MUL_20100615
5. http://maximintegrated.com/en/solutions/plc/index.mvp
6. http://machines-information-systems/plc