

# The new drilling control and monitoring system

Artymiuk Jan<sup>1</sup>, Marek Sokalski<sup>2</sup>

## Abstract

The new Drilling control and monitoring system, DrillView, is used on a number of new drilling units in the North Sea and in the Caspian sea. The DrillView system is a modular system that can be used on any size drilling unit, from a single portable top drive to a complete drilling unit with automated pipe handling, cement system, mud system and third party equipment. The Human Man Interface (HMI) is based on touch screen technology (ATEX approved where required). The communication network is based on Ethernet and Profibus, giving full remote operation and monitoring functionality.

**Key words:** drilling control, monitoring system

## Introduction

The DrillView control system is a control system designed for large, automated drilling units [7]. Due to the flexibility of the control system and modern networks technology, DrillView can be used for small drilling units, such as an small portable land rig, as well as for double floating deep water rigs. This can be compared to a PC network. A PC network can easily be configured from one small office with 2 – 3 users, to large co-operations with many thousand users.

The DrillView system is designed as an independent, high resolution graphical display system, for distributed monitoring and control of real time and stored drilling data. DrillView acts as an integrator of information from the drilling site. The following figure 1 gives a conceptual overview of DrillView/DCMS.

## Drill view system components

The DrillView system shown in Figure 1 has the following main components:

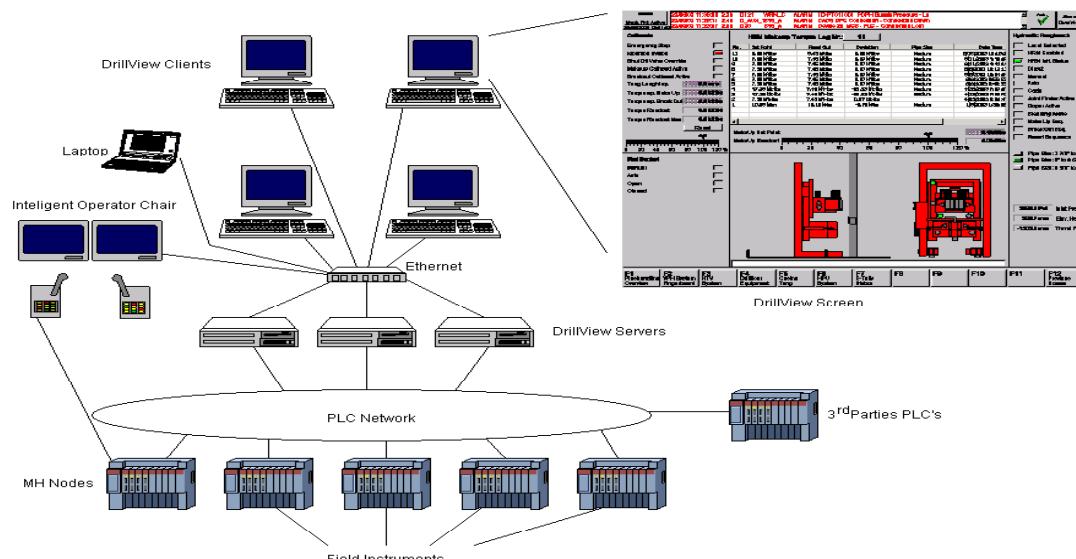


Fig 1 System DrillView

<sup>1</sup> Artymiuk Jan, University of Mining and Metallurgy; Faculty of Drilling, Oil and Gas; Al. Mickiewicza 30; 30-059 Cracow, Poland.

<sup>2</sup> Marek Sokalski, Maritime Hydraulics, Drilling modul&Drilling Equipment, N-4604 Kristiansand, Norway.  
(Recenzovaná a revidovaná verzia dodaná 29. 9. 2004)

## **Remote I/O**

The instrumentation connected to the mechanical parts, tanks, machines etc. are usually connected to a remote i/o unit. The advantages are that the cabling is reduced to a minimum. For very small units, the cabling may be 1:1 to the control cabinet.

## **PLC**

The remote i/o, or the instruments, are connected to a PLC. For DrillView Siemens Step 7 PLC is used. This is a family of PLC, even containing a soft PLC implemented on a PC. Therefore the PLC size can be easily adjusted to the number of signals. When changes are required, e.g. that another machine needs to be controlled, the PLC can be changed for a larger, or two PLCs can be put in a network.

## **Profibus Network**

When more than one PLC is required, the PLC are connected in a ring network. This improves the system availability. The Profibus network can be a copper based network, or a fibre based network, or an combination.

## **DrillView Server**

The DrillView server is a standard PC based server. If a PC based PLC is used, this server is not required. In large systems a number of servers can be interconnected using Ethernet. All user are connected to these servers. This is usually local users and remote users using Internet.

## **Remote users and interface to Internet**

When interfacing control systems directly to Internet, the risk of virus attacks and data hackers is increased. Some users therefore describes a manual procedure for connection, requiring the Internet user to be manually connected. When the external user is connected, the access is open for hackers and virus. It is therefore recommended that the interface to Internet is via a router and a firewall.

## **Drillview system flexibility**

### **Single User System**

Describing the DrillView minimum system with stand-alone 19" touch screen.

### **Small Rig System**

Describing a small system like Khazar with one EIOC

### **Large System**

Describing Valhall

## **Drillview screens**

### **Main Overview**

This is a navigation-screen only. You can navigate to other screens by clicking/pushing the different buttons.

This is primary a navigation-screen. You can navigate to other screens by clicking/pushing the different buttons. The selection of wells and runs for logging are done on this page. To select which well to log to, select well from the top-left dropdown list, and which run from the dropdown list below. This is now the active well and all data are now logged to this well and run. To compare data from the active well with previously logged well data, activate compare with the Compare On/Off button. Then select well from the top-right dropdown list, and which run from the dropdown list below. This historical well data are now available and will be displayed in the "Depth Trends" as dotted lines. To add a new well, push the "Add Well" button.

The Bit Depth Selector is used to select from what source the to read bit depth.field makes the assistant driller, or higher configured role, able to select from what source used to read bit depth.

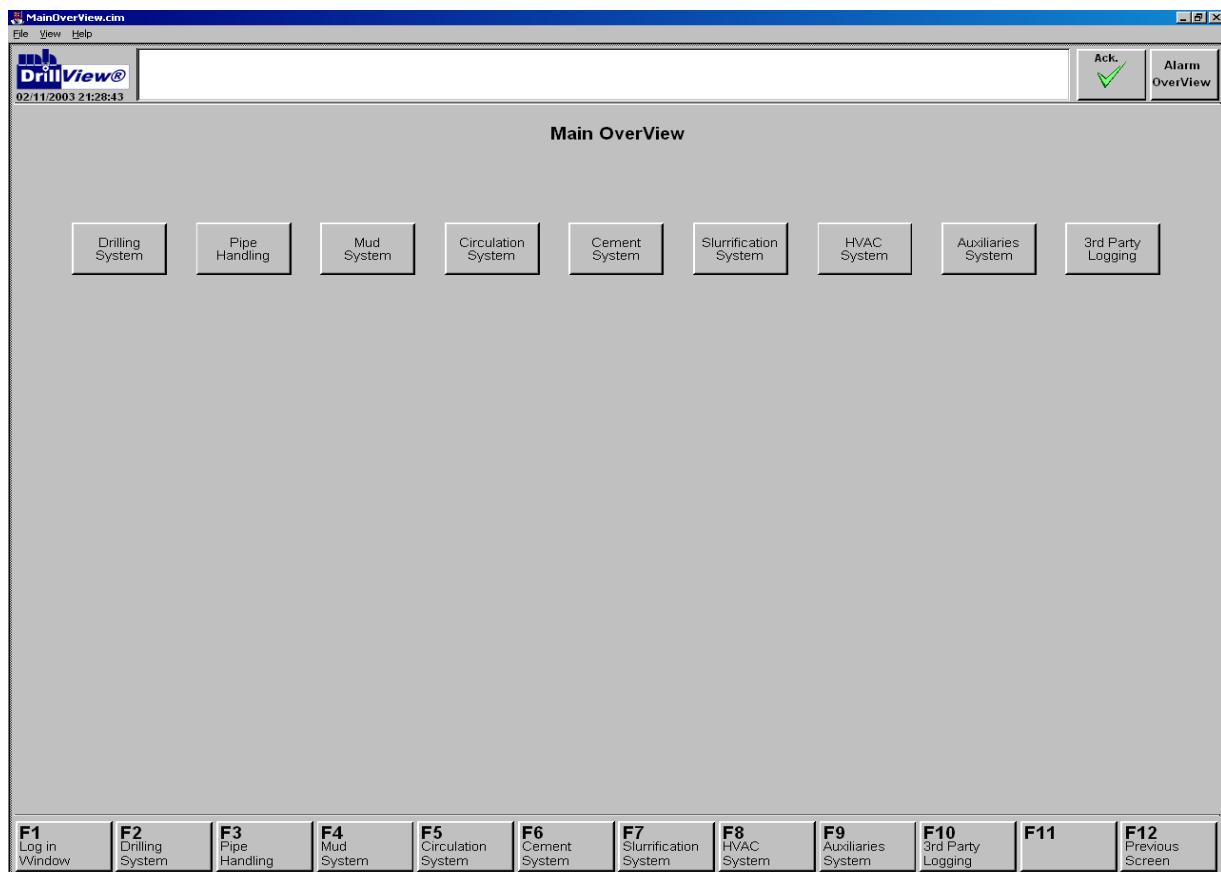


Fig. 2 Main Overview

### Drilling System Overview

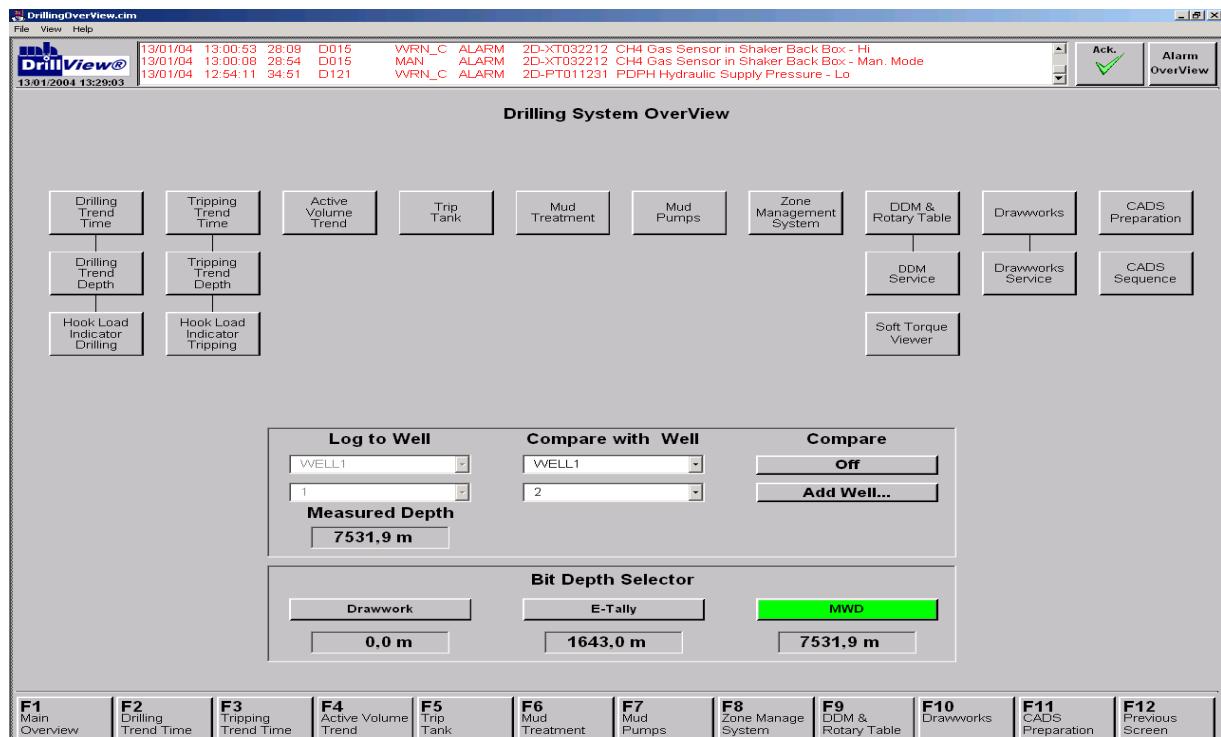


Fig. 3 Drilling System Overview

## Integration of Web CCTV

Description of new web based CCTV system.

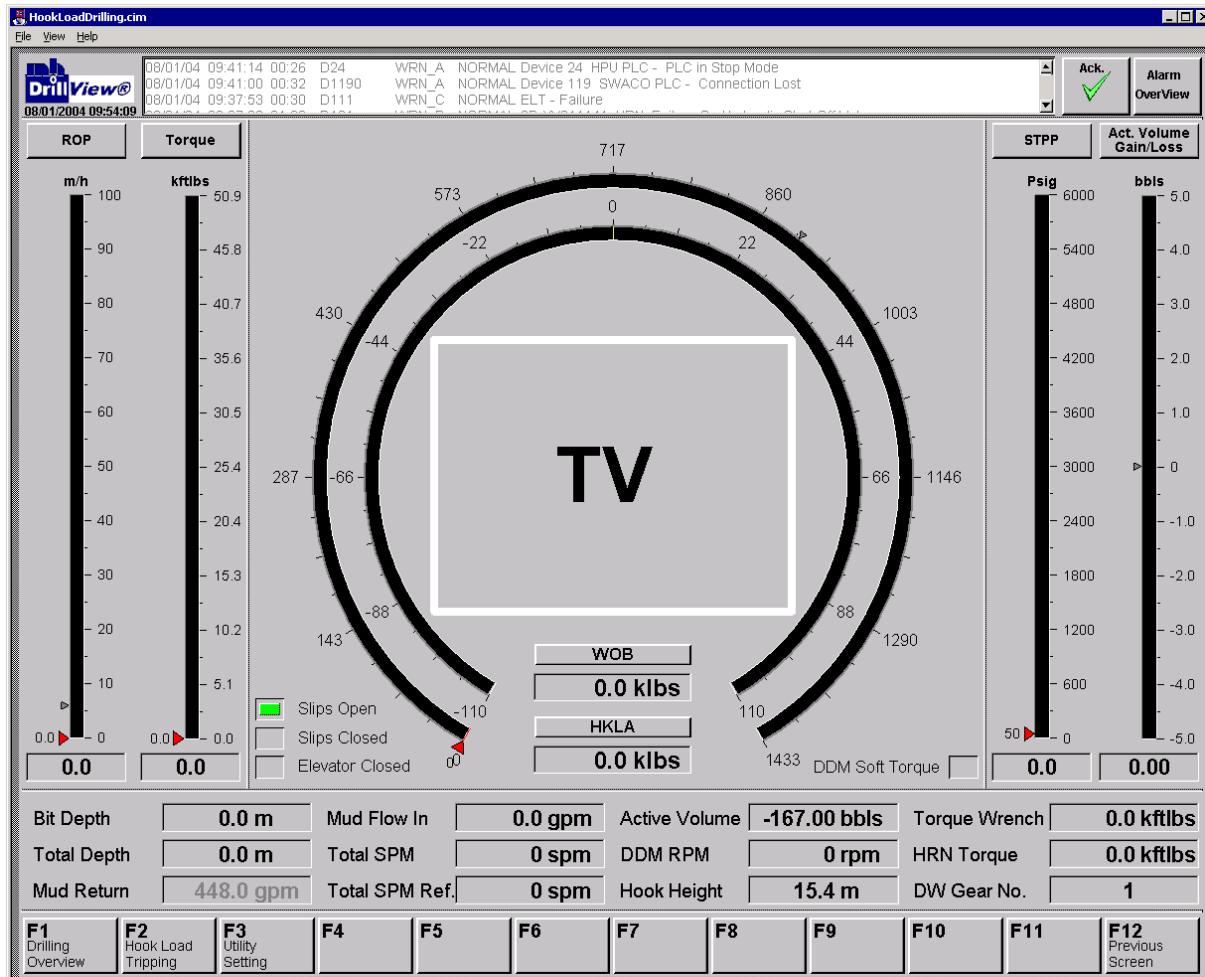


Fig. 5 Drilling Parameters Monitoring

## Diagnostics

For alarms see DrillView Alarm System – Functional Description ref.

### DrillView Client Status

The “Redundancy”-field shows which of the two DrillView servers who run as master and slave and if both servers are online. When both servers are Online, there will be a “Switch →” button visible between the servers. To switch which server to run as master/slave, press the “Switch →“ button. (The “→“ points at the server that will become master). The Electrician and the dvsAdmin user have access to do this switching.

The Communication Server/PLC Screen displays the communication between the DrillView application and the PLCs connected in the network. Counters that change regularly indicate functional communications. If one counter does not change for some time, there might be a communication problem or the PLC may have gone in stop mode.

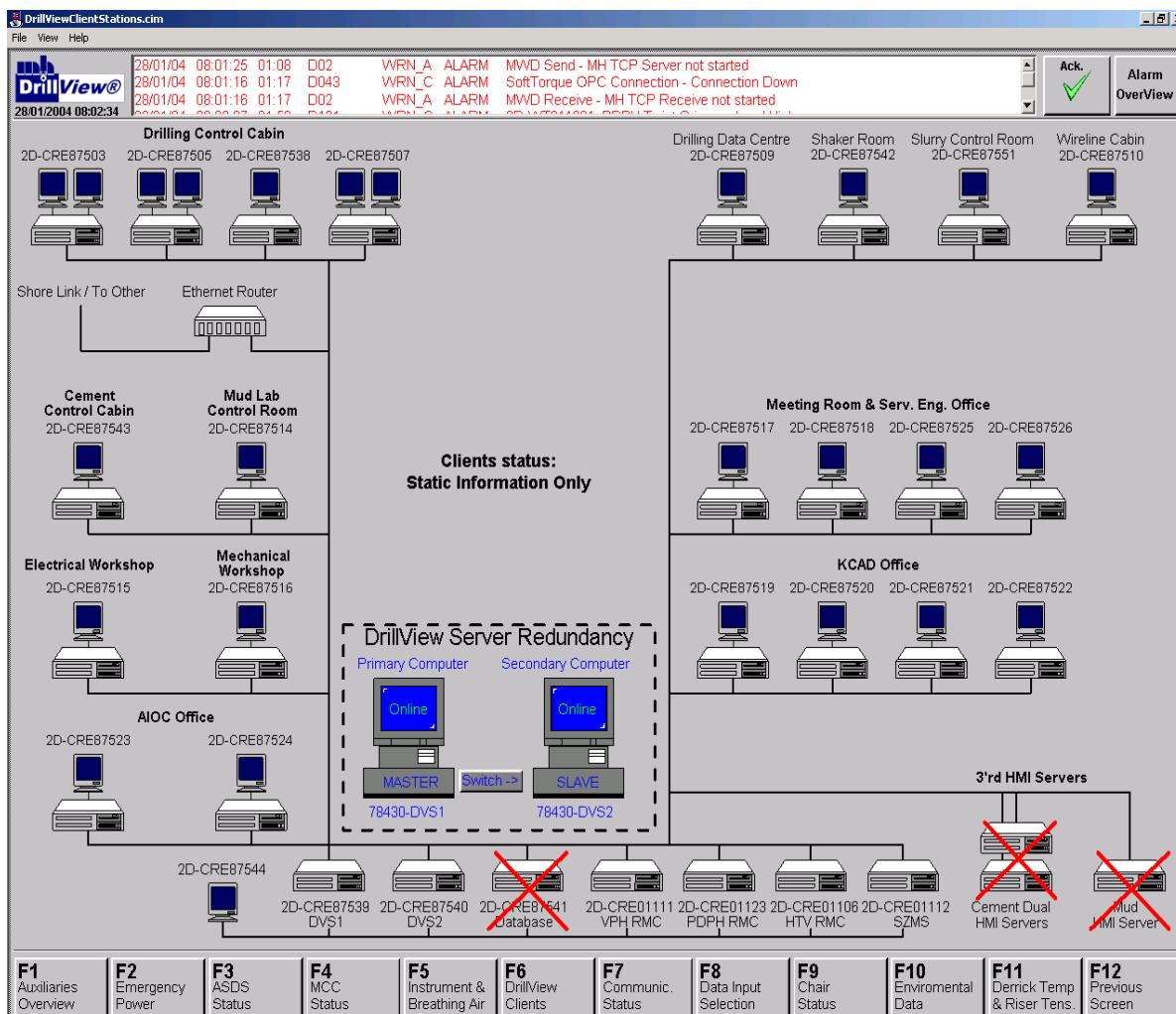


Fig. 5 This screen shows the DrillView PC-network.

## Communication Status

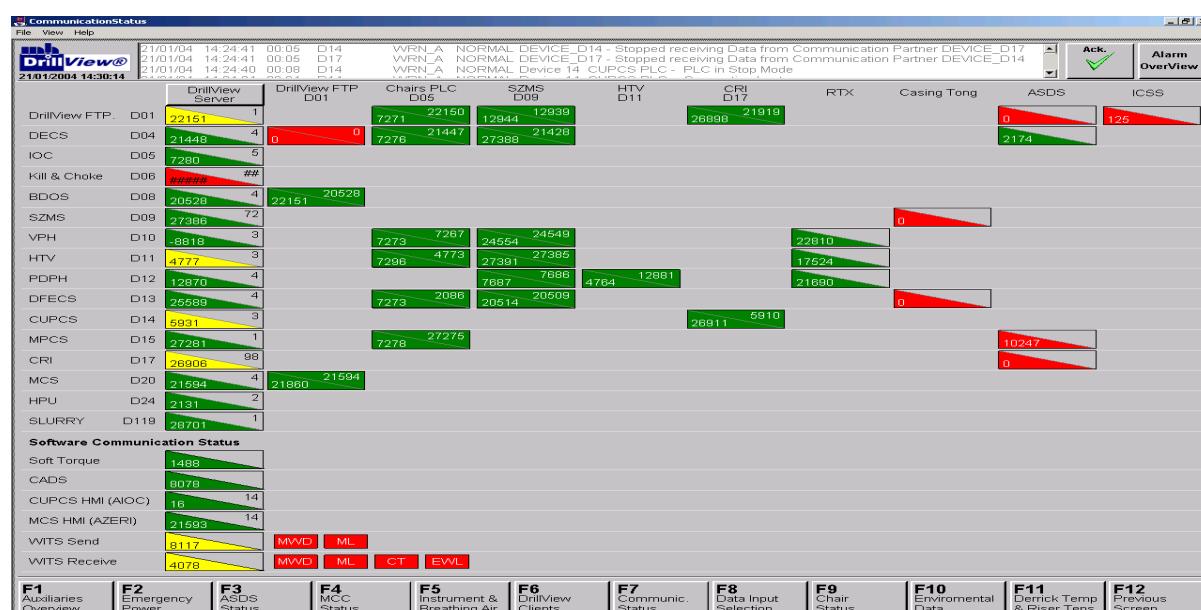


Fig. 6 Communication Status Screen

The Communication Status Screen displays the communication between the DrillView application and the PLCs connected in the network. Counters that change regularly indicate functional communications. If one counter does not change for less than 6 seconds, there might be a communication problem or the PLC may have gone into stop mode. An alarm will occur in the alarm banner.

## Communication Server/PLC

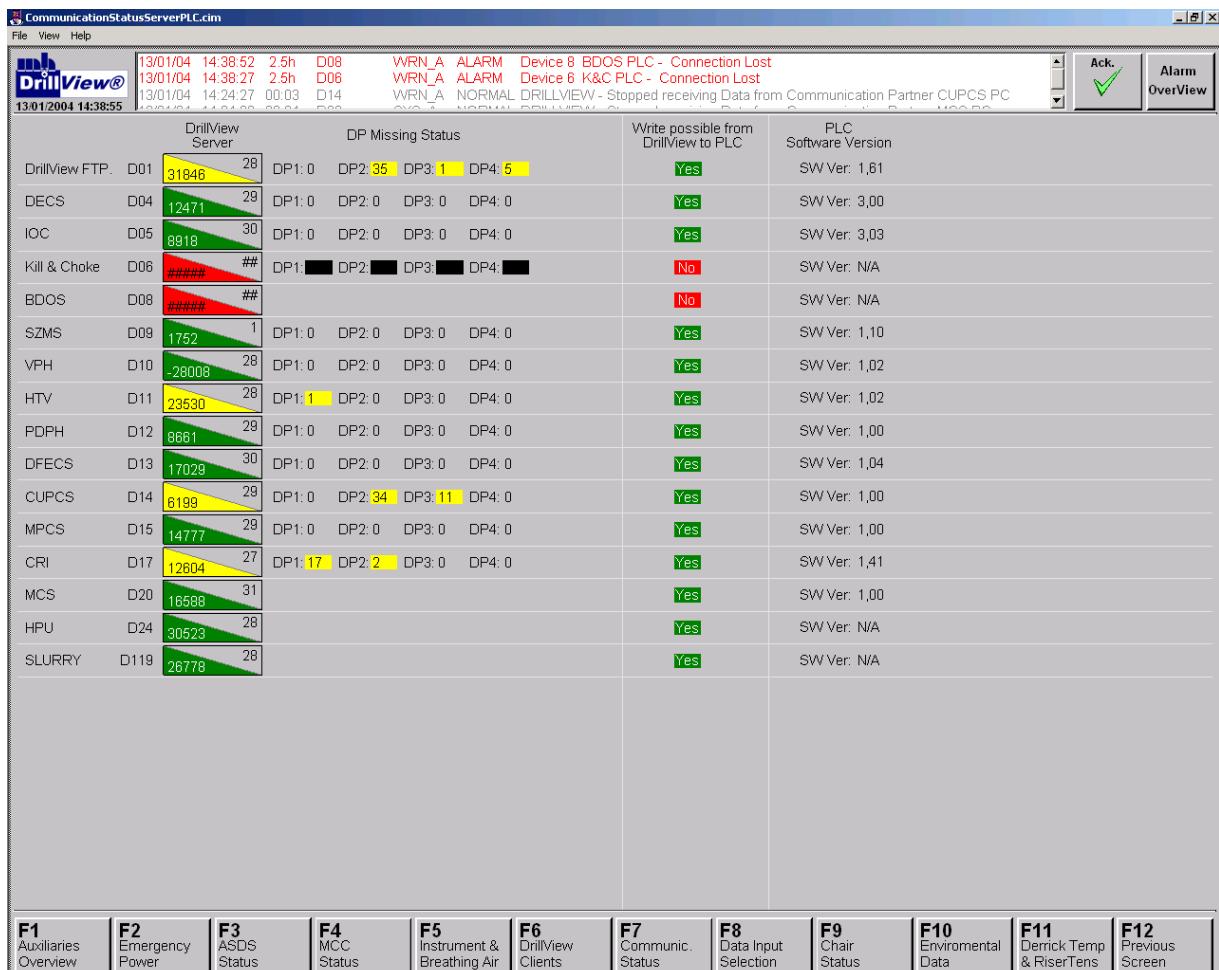


Fig. 7 The Communication Server/PLC Screen

## Conclusions

Modern information technologies, interconnected with automated drilling systems [1], matter more and more in oil industry. Satellite access to the internet, computer nets and PLC increase drilling effectiveness and enable to current and better control of drilling. Drilling control system is also supported by fast information exchange [2, 3, 4, 5 i 6]. The DrillView System, from Maritime Hydraulics, presented in the publication, has a great potential, which enables it to implement various technologies for oil industry and for drilling itself [7].

The DrillView System has following tasks:

1. Helping human to take possibly the most advantageous decisions.
2. Facility for select rig control.
3. Control of drilling processes, while using one or any number of drilling units in the same time.

### References

- [1] Artymiuk, J., Sokalski, M.: New technologies in drilling., *Automation of select drilling processes., New methods and technologies in petroleum geology, drilling and reservoir engineering: 14th international scientific-technical conference: Zakopane, 11-13 June 2003.*
- [2] Artymiuk, J., Wróbel, Ł: New decision systems in drilling., *New methods and technologies in petroleum geology, drilling and reservoir engineering : 14th international scientific-technical conference : Zakopane, 11-13 June 2003.*
- [3] Finley, D., B., Pahmiyer, R., C.: Well Testing in the New Millenium - Real Time, *SPE 68757, 2001.*
- [4] McGinley, P., J.: Leveraging off Advances in Internet Technology to Bring Data to the Expert User On-Shore, *SPE 56687, 1999.*
- [5] Murray, D., Montgomery, D., Florence F.: Risk Mitigation Technique for Advanced Rig Control Systems, *IADC/SPE 72329, 2001.*
- [6] Trantham, J., A., Deagen, J., M.: Barrier-Free Learning for Well Construction, *SPE 62833, 2000.*
- [7] General Catalog Maritime Hydraulics, 2004.