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ESIM-FLS2

Logging Simulation Training System

Technical Specification

1. Introduction

The compound logging simulation training system is an advanced training simulation system, used to provide compound logging training for the logging crew, logging workers in training centers as well as petroleum universities and colleges. The system adopts a full-size logging unit, sand table of well site model, sensor models, advanced logging software, as well as the drilling accidents simulation software and sensor detection software developed by our company, providing trainings of the whole process of compound logging, and enabling students to master various operation skills and accident treating methods of compound logging.

System main functions:

1. Presenting well site constructions and the role logging plays in drilling operation;

2. Training students of the structure and operation methods of gas detection system;

3. Simulating 5 kinds, totally 46 items of accidents; Students can master various ways of accident forecast and treatment.

4. Familiarizing students the role sensors play in logging as well as the installation position of sensors in well site;

5. Instructor could demonstrate how to operate the software in the compound logging simulation training system through KVM system.

2. System Component

2.1 Major Hardware

The structure of this system is as shown in figure 1. The system is composed of explosion-proof units, machine cabinet, gas detective device, sand table of well site model, sensor models, power controlling system, KVM system, projecting system, etc.

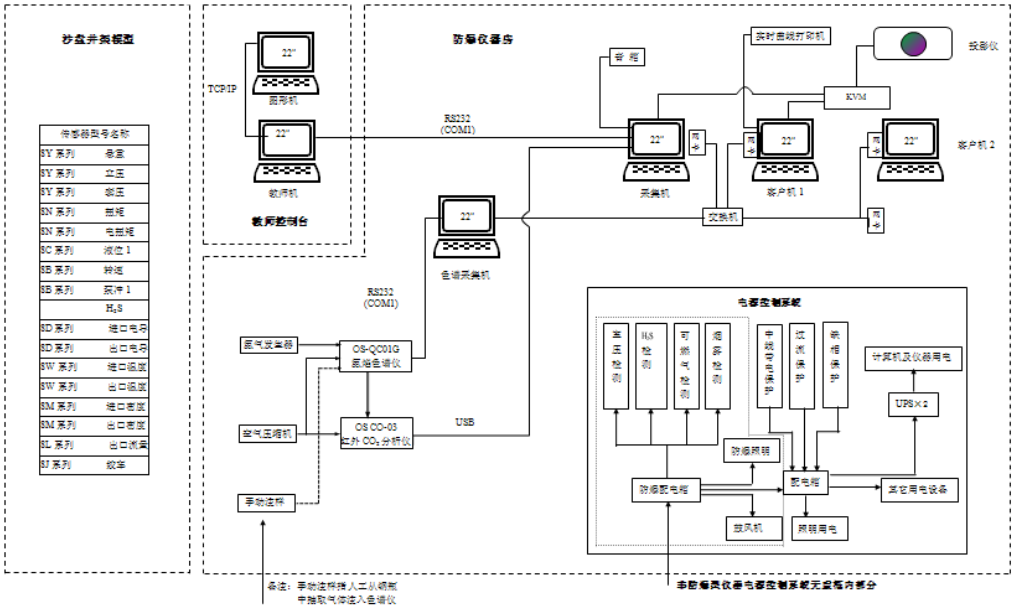


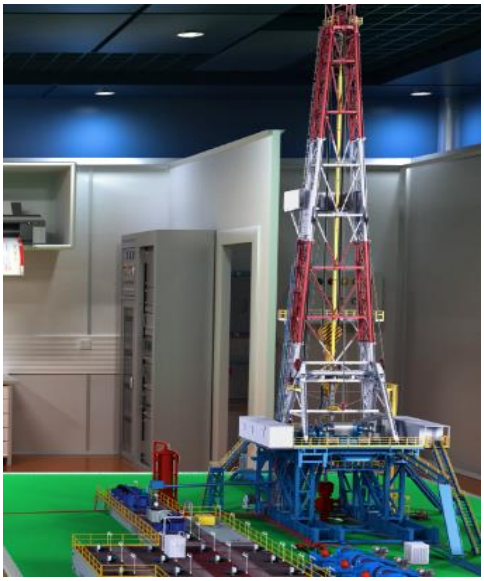
Figure 1 System hardware framework

1. Explosive-proof units: Full size compound logging explosion-proof simulates the SK-2000FC logging units, the devices layout is the same as the real equipment is real site.

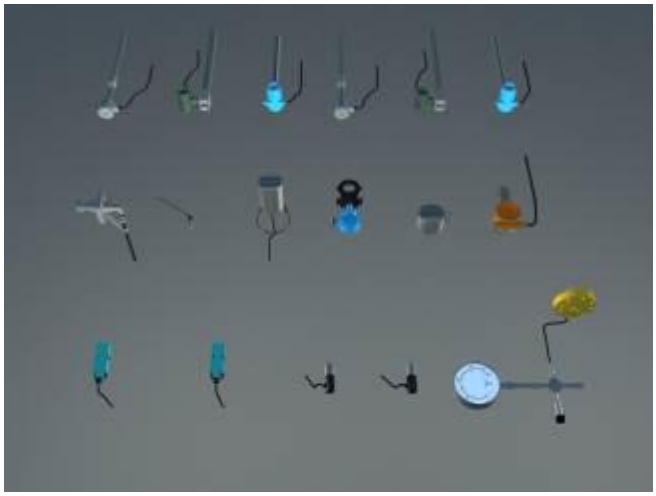
2. Machine cabinet: Machine cabinet integrates the computers, Hydrogen flame chromatograph, Infrared CO_2 analyzer, Hydrogen generator and power control panels, which is easy to operate.

3. Gas detection device: This device includes OS-QC01G hydrogen flame chromatograph, OS CO-03 infrared CO_2 analyzer, hydrogen generator, air compressor and electrical mud degasser.

4. Sand table of well site model: the sand table model is made according to 70D drill rig by the scale of 1:20. The layout is exactly as the real well site, which makes up an impressive environment. Students can learn various systems of the rig, connection of various pipes, devices on rig floor, structure and functions of irrigation unit, etc.



5. Sensor models: The models include all sensors in real logging site, such as draw-works sensor, pump stroke sensor, rotary table rotation rate sensor, rotary table torque sensor, inflow/ outflow electric conductive sensor, inflow/ outflow density sensor, inflow/ outflow temperature sensor, ultra-sonic pit level sensor, electric torque sensor, standpipe pressure sensor, casing pressure sensor, hook load sensor, and H_2S sensor.



6. KVM system: KVM exchanging machine connects keyboard, mouse, VGA post. Instructor can visit and control the computers in logging units from one terminal, and demonstrate the student how to run the software, and can also choose to project any computer in logging unit on the screen. In this way, students can easily observe while learning.

2.2 System Software

1. Drilling accident simulation software
2. Compound logging software system
3. Sensor detection master control software
4. Sensor detection graphics software
5. Sensor detection PLC program
6. Power control system PLC program
8. Sound effect control module software
9. System self-checking module
10. Students managing and automatic scoring software module

3. System Functions

3.1 Functions and Features

1. The system provides an immersive logging environment. Gas detection system, explosion-proof system and compound logging software system adopt the devices from production site, which greatly improve the training quality.

2. Drilling accident simulation software, of which Esimtech Company owns independent intelligent property right, can simulate various accidents in drilling process, totally 6 kinds including 46 items of accidents. The software can playback the real logging data of 5 wells, and simulate drilling process such as tripping in, drilling, circulating, reaming, etc.

3. Logging software adopts the solution of Riglog developed by Shanghai Oushen Company. Riglog is the compound logging software extensively used in oilfield logging. It can acquire, record data of various sensors and chromatograph, and print the data at real time.

4. Sensor detection software system contains sensor detection master control software, sensor detection graphics software and sensor detection PLC program. When students don't know where to install the sensor, they can insert it in the corresponding aviation connector, and the graphics program presents the data of the sensor such as the installing position and

measurement range.

5. PLC program of power control system is mainly used in monitoring H_2S sensor, flammable gas sensor, smog sensor and micro difference pressure sensor in logging units. When the sensors launch alarm, the electrical degasser will be powered off automatically.

6. The system can automatically score student's operation. It can give score and point deducting reason automatically according to student's operation procedure.

3.2 Simulated Problems and Troubles

1. Tripping in
    1) Lost circulation when tripping out
    2) Kick when tripping out
    3) Influx when tripping out
    4) Blowout when tripping out
    5) Getting stuck when tripping out
    6) Raising and unfreezing
    7) Oil or water immersion when tripping in
    8) Lost circulation when tripping in
    9) Kick when tripping in
    10) Influx when tripping in
    11) Blowout when tripping in
    12) Getting blocked when tripping in
    13) Stuck pipe when tripping in
    14) Drill pipe broken
    15) Nozzle plugged
    16) Abnormal standpipe pressure
2. Monitoring circulation and static state
    1) Lost circulation
    2) Oil or water immersion
    3) Influx
    4) Kick
    5) Blowout
3. Accidents when drilling and reaming
    1) Bit service life end
    2) Lost cone
    3) Bit worn out

4) Drilling string leaking
5) Drilling string broken
6) Lost circulation
7) Well immersion (gas immersion, brine immersion)
8) Kick
9) Influx
10) Drill pipe not well braked
11) Percussion drilling
12) Emptying
13) Nozzle plugged
14) Lost nozzle
15) Bit balled up
16) Stuck pipe
17) Wall collapse
18) Standpipe pressure changing because of drilling fluid density
19) Pump leaking
20) Pump water feeding failure
21) Bypass valve broken
22) High pressure pipe leaking

4. H2S detection
   1) Formation H2S
   2) Non-formation H2S
5. Monitoring formation pressure
6. Damper failure

4. Technical Parameters and Operational Environment

4.1 Technical Parameters

(1) Power supply: 110~220V/50~60Hz AC
(2) Power consumption: <6000W
(3) Resolution: 1024*768
(4) Brightness: >=4000ANSI Lumens

4.2 Operational Environment

(1) Area: >=10*8.5m
(2) Separate equipment power supply from light power supply
(3) Working temperature: 0℃ ~ 30℃

(4) Relative humidity: <90%

5. System Layout and Program Interfaces

Figure 2 System whole layout

Figure 3 Drilling accident simulation software

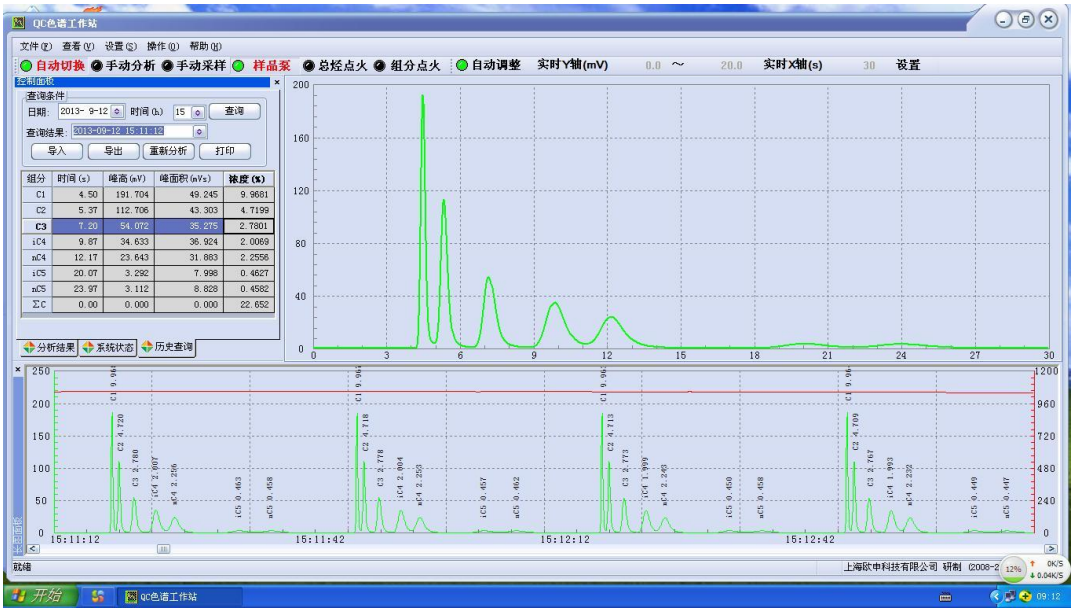


Figure 4 Chromatographic analysis interface

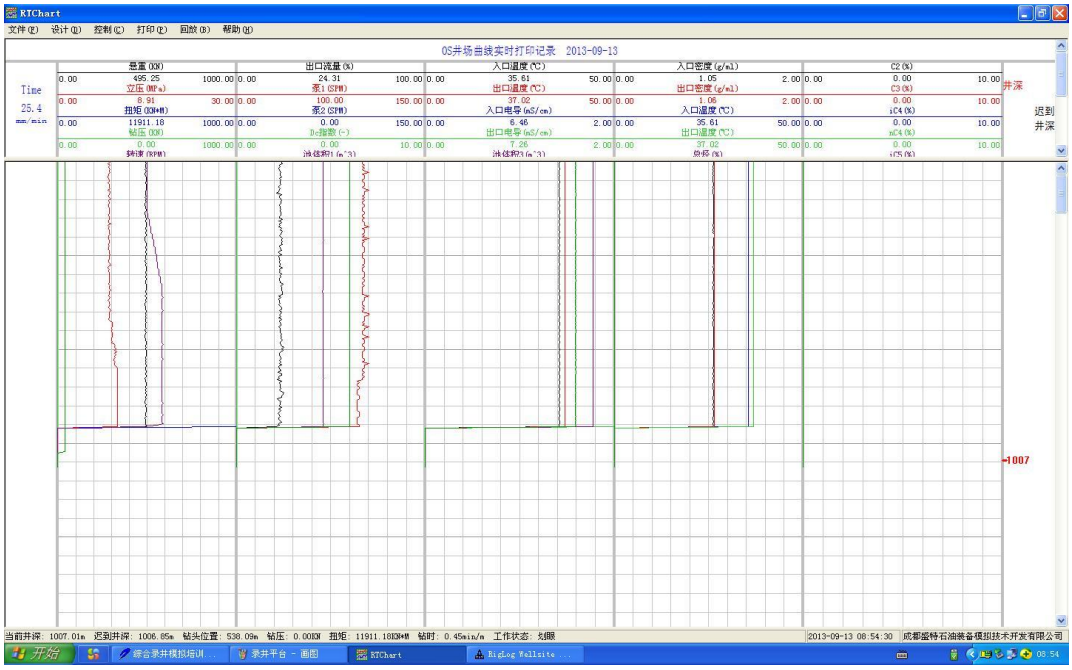


Figure 5 Real time curve interface

Figure 6 Logging platform software