EAI Endorsed Transactions
on Energy Web
Research Article EAI.EU

New Approach to SCADA System Screen Configuration Based on the Model of Oil and Gas Pipeline Network

He Huang[1,2,*], Yafeng Li[1], Liang Ma[3], Bingqiang Mao[1], Lin Zhang[1], Jingli Yang[1], Haishan Wang[3], Yanguo Sun[1], Xiaochuan Zhao[1] and Muhao Lv[1]

[1] PipeChina Oil and Gas Control Center, Beijing 100000 , China
[2] School of Software, Tsinghua University, Beijing 100000, China
[3] Kunlun Digital Technology Co.,Ltd., Beijing 100000, China

Abstract

INTRODUCTION: With the continuous progress of science and technology, the monitoring and control of oil and gas pipeline networks have become more and more critical; SCADA systems, as a kind of technology widely used in industrial control, play a key role. The screen configuration of the SCADA system is the core part of its user interface, which is directly related to the operator's mastery of the status of the pipeline network. In order to improve the monitoring efficiency and reduce the operation risk, this study is devoted to exploring a new method of SCADA system screen configuration based on the oil and gas pipeline network model.
PURPOSE: The purpose of this study is to develop an innovative SCADA system screen configuration method to present the operating status of the oil and gas pipeline network more intuitively and efficiently. The design based on the pipeline network model aims to enhance the operators' understanding of essential information, such as pipeline network topology, fluid flow, etc., so as to make monitoring and control more intelligent.
METHODS: The study adopts a new method of SCADA system screen configuration based on the oil and gas pipeline network model. First, the topology, sensor data, and control nodes of the oil and gas pipeline network are comprehensively modelled. Then, through the design principle of human-computer interaction, the modelling results are integrated into the screen configuration of the SCADA system to realize the intuitive presentation of information. At the same time, advanced visualization technology is introduced so that the operators can understand the real-time changes in the pipe network status more clearly.
RESULTS: After experimental verification, the new method shows significant advantages in oil and gas pipeline network monitoring. The operators can recognize the abnormalities of the pipeline network more quickly and accurately through the SCADA system screen configuration, which improves the efficiency of troubleshooting and treatment. The visualized interface design makes the operation more intuitive and reduces the possibility of operating errors, thus improving the safety and reliability of the pipeline network.
CONCLUSION: The new method of SCADA system screen configuration based on the oil and gas pipeline network model has achieved significant results in improving monitoring efficiency and reducing operational risks. Through a more intuitive and intelligent interface design, operators can have a more comprehensive understanding of the operating status of the pipeline network, which provides practical support for rapid response and decision-making. This approach introduces new ideas to the field of oil and gas pipeline network monitoring, which is of positive significance for improving the overall performance of the system. Future work can be carried out to optimize the interface design further and expand the applicable scenarios.

Keywords: oil and gas pipeline network; SCADA system; screen configuration; pipeline network modelling

Received on 29 February 2024, accepted on 15 March 2024, published on 19 March 2024

Copyright © 2024 H. Huang *et al.*, licensed to EAI. This is an open access article distributed under the terms of the CC BY-NC-SA 4.0, which permits copying, redistributing, remixing, transformation, and building upon the material in any medium so long as the original work is properly cited.

doi: 10.4108/ew.5247

*Corresponding author. Email: 345795778@qq.com