Reproducible Technology Case Sharing

—— Smart Station

Beijing Anvision Technology Co., Ltd.

东方智慧 全球分享

Oriental wisdom , Global sharing

Contents

Project Background and Customer Pain Points

Smart Station

1) Smart BIM Platform
2) Intelligent AI Security
3) Job Ticket Control Platform
4) Integrated Control System
5) Smart Station Management Platform
6) Intelligent Real-time Measurement
7) Digital Twin Visualization
8) Mobile App Platform

Summary of Project Innovations

Project Background and Customer Pain Points

Project Background

Roc Oil (Chengdu) plans to build a natural gas dewaxing and boosting station near Well 70 to achieve ***the dew point standard of natural gas***, ***overcome*** the existing pipeline transportation ***capacity constraints***, and further ***unleash the production potential*** of the Bajiaochang-Block

Traditional construction methods cannot meet the urgent demand for capacity breakthroughs from the client. Anvision introduced the concept of a smart station and corresponding system applications during the design, construction, and operation phases. This ensured rapid and safe station commissioning, addressing the client's most pressing needs. Additionally, through the smart management platform during the operational phase, process management was optimized, equipment maintenance efficiency was improved, and the operation process was intelligently implemented. This provided managers with real-time monitoring, remote management, and visualization capabilities, significantly reducing management and operation costs

Project Background and Customer Pain Points

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1 Challenge of Capacity Expansion

Due to the issue of insufficient processing capacity, further capacity release is hindered, posing significant challenges and constraints

2 Rapid and Secure Station Construction Demands

Traditional construction approaches with lengthy timelines, high costs, and low levels of intelligence struggle to address customer construction demands

3 Real-time Measurement Handover Requirement

Involving three-party measurement confirmation poses a significant workload. How can we achieve handover data recognized by all parties efficiently and accurately? Striving for a quick, efficient, and precise measurement process

4 Operational Management Cost Reduction and Efficiency Enhancement Demand

With extensive operational tasks at the station and high personnel costs, coupled with the remote location of the station, the challenge is how to enable remote operational management

Market Opportunity

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1.Data Integration and Interoperability

Addressing the Data Silo Issue, Ensuring Smooth Data Circulation Across Different Stations and Departments

2.Automated Report Generation

Developing tools to achieve automated report generation, enhancing data analysis efficiency

3.Real-time Data Visualization

Delivering a real-time data presentation solution to enhance management's immediate understanding of production conditions

4.Standardized Smart Station Solution

Developing standardized smart station solutions to expedite the deployment of other stations and reduce costs

5.Enhancing Production Efficiency

Aiding stations in improving production efficiency, reducing operational costs, and achieving capacity enhancement

6.Data Security and Compliance

Providing data security and compliance solutions to ensure data protection and adherence to regulations

The smart management system integrates data, optimizes resources, making station production management more convenient, precise, secure, and timely, thereby achieving a data-driven transformation for the station

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Summary of Project Innovations

Smart Station — Construction Phase

1) Intelligent BIM Platform

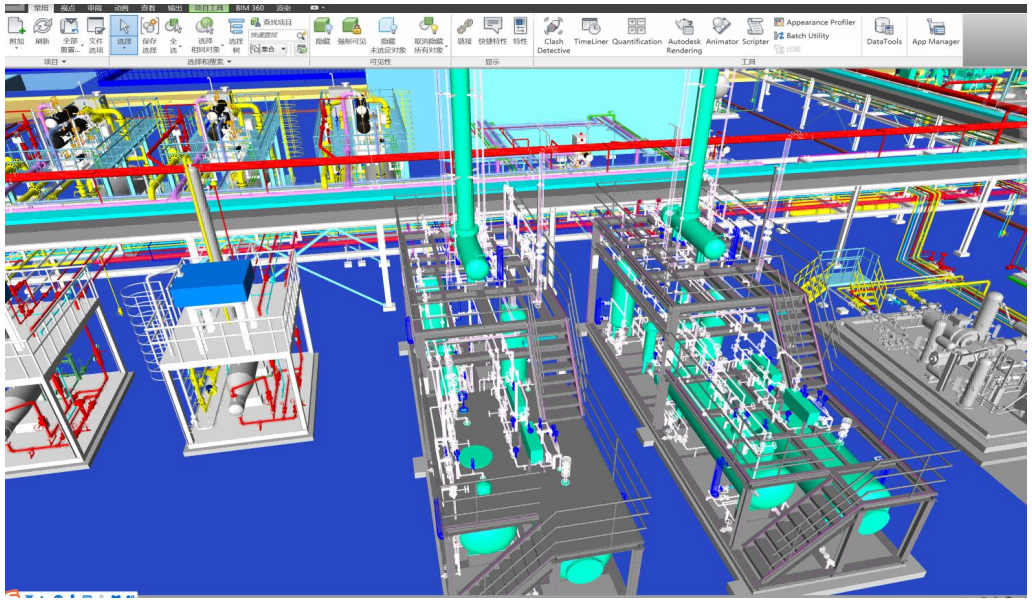
a) Design Phase: Layout ***design and verification*** using 3D BIM software

b) Procurement Phase: ***Continuously update models*** based on actual conditions

c) Construction Phase: ***Guide installation and construction throughout the process*** based on 3D design, refining the 3D model

d) Operational Phase (Inspection and Maintenance): Record essential information from all construction plans for a ***reliable data foundation*** in future maintenance work

Real-time comparison of construction progress and anomalies, achieving progress tracking, and enabling efficient supervision and execution



Smart Station — Construction Phase

2) Intelligent AI Security

Customer Pain Points:

Complex personnel structure with multiple construction participants, uneven safety awareness, posing management challenges;

Costly and abundant on-site materials, reliance solely on individuals making it difficult to ensure material safety;

Frequent cross-operations in a fast-paced construction process, challenging to guarantee safety in the interaction between personnel and vehicles

Solutions:

Upcycling: Integrate existing Rock video feeds into the platform for comprehensive scene monitoring

Continuous Monitoring: Implement **20** perimeter security routes for surrounding construction, and install **50** intelligent monitoring routes in the equipment area, achieving full coverage monitoring in key areas

Early Warning Alarms: Realize analysis of over 20 unsafe behaviors, remote monitoring of inspections, full-process recording of operations, project progress control, and construction safety alarms

Personnel Behavior Analysis

- Facial Recognition
- Personnel Gathering
- On-Duty Analysis
- Unauthorized Smoking
- Talking on the Phone
- On-Duty Sleeping Analysis
- Hard Hat Detection
- Loitering Detection

Environmental Monitoring

- Obstruction by Objects
- Zone Entry and Exit
- Zone Intrusion
- Sedimentation Detection
- Drainage Detection
- Sewage Sludge Overflow Detection
- Floating Debris Detection

Traffic Monitoring

- Vehicle Occupying the Lane
- Object Handling Detection
- Electric Scooter Detection
- Cross-Line Counting

Fire Alarm Detection

- Flame Detection and Early Warning

High adaptability, versatile applicability, diverse algorithm types, and precise recognition

Smart Station — Construction Phase

3) Work Permit Control Platform

Customer Pain Points:

Ticket Personnel Management: Paper work permits cannot address consistency issues

Low Efficiency: The signature process for issuing permits is complicated and inefficient;

Difficulty in Historical Data Retrieval: Challenging to review and manage historical work permits;

Many Blind Spots in Supervision: Issuing permits based on experience, lacking a unified standard

Solutions:

Work Permit Control Platform:

Intelligent video verification against personnel and permits; inconsistencies prevent work issuance

Entire process of online permit issuance and approval: Enhance efficiency, achieve intelligent management

Unified standards, specifications, and management, with historical retrievability for convenience and efficiency

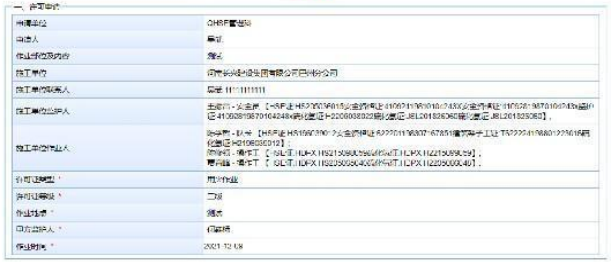
Implementing fully intelligent permit issuance has enhanced operational efficiency

Work Application

Work Inquiry

Pending Approval

Permit Application



Smart Station — Operational Phase

4) Integrated Control

Customer Pain Points:

Management Challenges: Difficulty in managing complex systems, necessitates effective tools

High Labor Intensity: Skilled personnel with high labor costs

High Operating Costs: High maintenance and energy costs

Demand for Energy Saving and Consumption Reduction: Energy savings equate to cost savings, requiring precise control

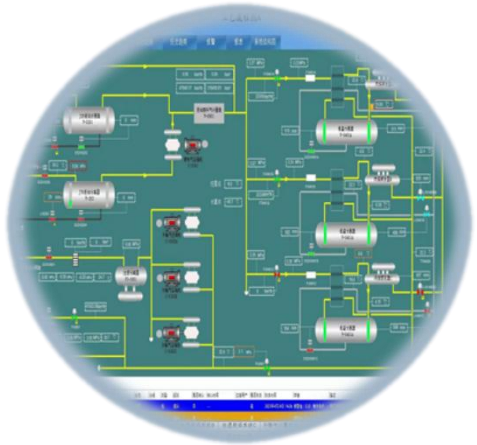
Solutions:

Integrated Control: The domestic system integrates DCS, SIS, and FGS, achieving integrated comprehensive control capabilities, ***enhancing system synergy***

Automatic Adjustment: Utilizing automation technology to regulate the production process, reducing the need for manual intervention and ***improving production efficiency***

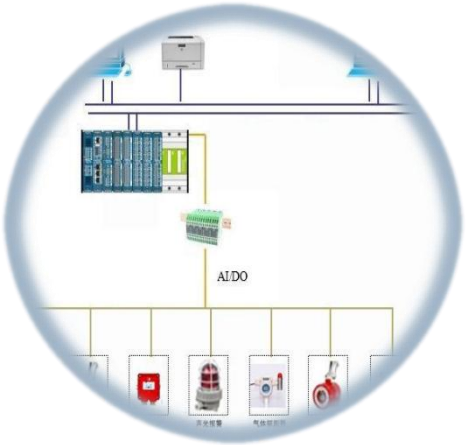
Real-time Alarm Function: The system can monitor and alarm in real-time, reducing the continuous screen monitoring burden on operators and ***enhancing production safety***

Four-Level Cascade Shutdown: Upgrading from the traditional two-level shutdown to a four-level shutdown reduces the impact of lower-level shutdowns on production and equipment



Distributed Control System (DCS)

Safety Instrumented System (SIS)



Fire & Gas System (FGS)

Ensuring the production, safety, and firefighting processes of the station, reducing the number of on-site personnel to 2 during daily shifts

Smart Station — Operational Phase

5) Smart Station Management Platform

Customer Pain Points:

Demand for Increased Production Efficiency

Concerns about Equipment Failures and Repair Delays

Is Manual Inspection Adequate?

Are Operating Processes Standardized?

Is the Management Process Transparent?

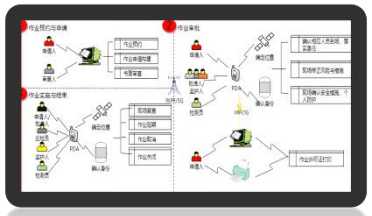
Solutions:

Intelligent Production Management

Remote management is implemented for production, equipment, inspection, security, and operational processes

Equipment Inspection: Accurate and Real-time

Complemented by efficient new technologies and products, real-time monitoring of equipment operation status is achieved through on-site integrated applications around the clock



Specialized Operation Management and Control

Achieving standardized and safe operations, reducing potential risks, minimizing hazards, preventing accidents, and enhancing the level of safety management.

Smart Station — Operational Phase

5) Smart Station Management Platform

Smart Production Management

Implementing intelligent management, including remote management of production, equipment, inspections, security, and operational processes

Program Achievements:

Enhancing Efficiency and Productivity:

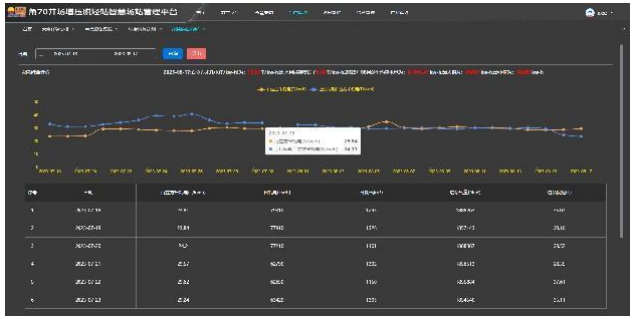
Remote management enables real-time monitoring and control, reducing downtime and increasing capacity

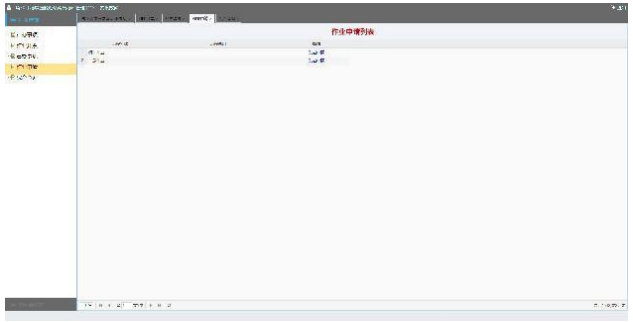
Data Analysis and Decision Support:

Collecting data from various sources, analyzing production processes, equipment performance, and trends to make informed decisions, thereby improving production quality and efficiency

Cost Savings:

Reducing labor costs, inspection costs, and operational expenses while simultaneously increasing resource utilization





Smart Station — Operational Phase

5) Smart Station Management Platform

Equipment Testing, Precision in Real-Time

In accordance with the objectives of intelligence, adopting efficient new technologies and products, integrating them on-site, and implementing real-time monitoring of equipment operations around the clock

Program Achievements:

Reducing Maintenance Costs:

Timely identification of potential faults and issues, making maintenance more preventive and precise, thereby lowering maintenance costs

Enhancing Equipment Reliability:

Reducing equipment failures and downtime, thereby increasing the lifespan of the equipment

Optimizing Resource Utilization:

Real-time monitoring and data analysis aid in better resource utilization, including energy, raw materials, and human resources, leading to cost reduction

Smart Station — Operational Phase

5) Smart Station Management Platform

Specialized Operation Management and Control

Specialized operation management and control achieve orderly and compliant operations, reducing risks, minimizing hazards, preventing accidents, and enhancing the safety management level in operational processes

Program Achievements:

Ordered Workflow:

Ensure compliance with the sequence and requirements of each step

Risk Reduction:

Minimize the presence of potential risk factors, reducing the probability of accidents

Hazard Reduction:

Identify and eliminate potential hazards and safety risks to ensure a safer workplace

Accident Prevention:

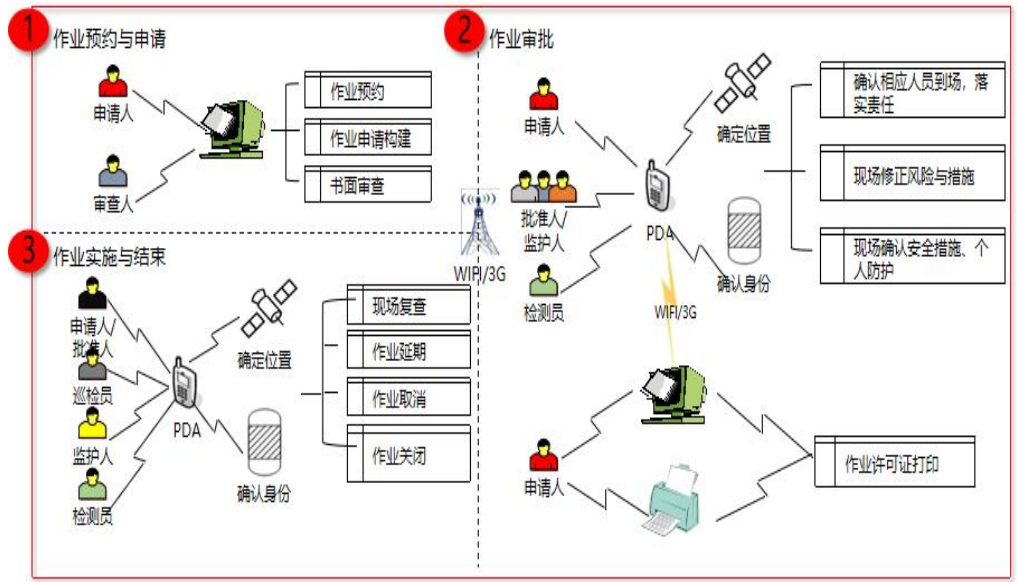
Effectively prevent accidents, ensuring the safety of employees' lives and property

Employee Awareness:

Enhance employees' awareness and importance of safety

Monitoring and Feedback:

Real-time reporting aids in quickly identifying and addressing potential issues



Smart Station — Operational Phase

6) Intelligent Real-time Measurement

Intelligent Metering Handover

Process management based on intelligent metering handover achieves real-time statistics of process parameter compliance rates and device operation records

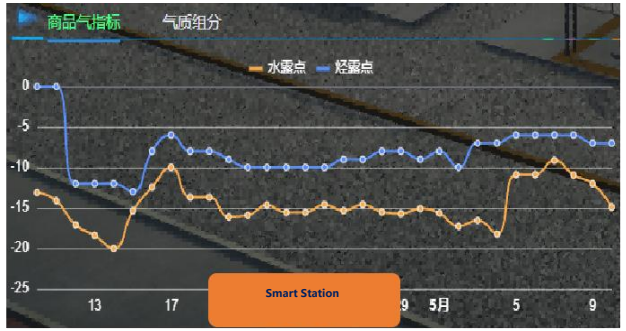
Customer Pain Points:

Need to improve production efficiency

Is production data collected and shared in real-time?

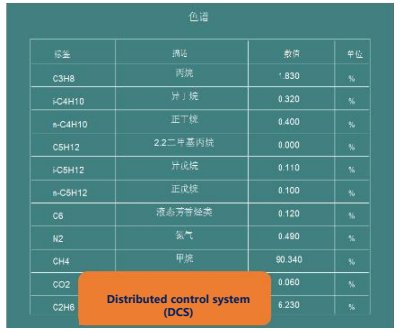
Are metering data automatically calculated and reliable?

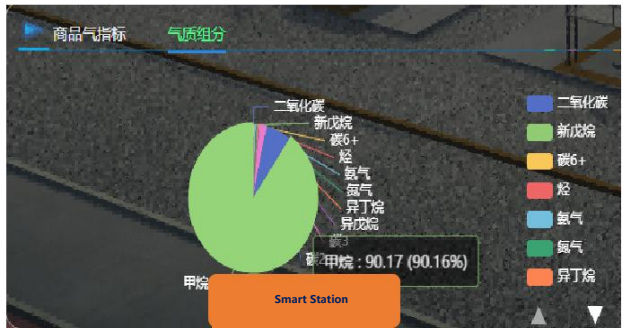
Is the production process analyzed in real-time with intelligent warnings?



Solution:

Implement intelligent water, hydrocarbon dew point, and chromatographic analysis. Combine this with an intelligent flow metering system to ensure automated handover confirmation throughout the entire process from raw materials to sales





Smart Station — Operational Phase

7) Digital Twin Visualization

Digital Twin

Customer Pain Points:

- ***Inaccurate location identification for station alerts;***
- ***Lack of uniformity in inspection routes and content;***
- ***Inability to monitor equipment information in real-time;***

Solution Achievements:

Implementation of a smart twin system for pipeline stations, **ensuring production safety, enhancing control efficiency, and improving operational quality, achieving lean production** in station operations;

Full coverage of video surveillance for station monitoring, **real-time surveillance, remote warnings, quick positioning**, and assistance in problem resolution;

Real-time reflection of the production process of the corresponding physical station, **enabling three-dimensional virtual inspections for a comprehensive understanding of the inspection process;**

Digital Station

Video Surveillance

Virtual Inspection

Smart Station — Operational Phase

8) Mobile App Platform

The mobile app platform enables efficient and streamlined office operations

Implementing lean operations, standardized on-site procedures, meticulous management, strengthening material quality control, continuous on-site support from technical experts throughout the entire process, and improving the efficiency of construction management and decision-making

01 Production Process Management

Real-time access to production process data, enabling instant push notifications for alarms and warnings

02 Smart Production Operations

Real-time monitoring of the production process, access to production data anytime, anywhere, and instant push notifications for production alerts

03 Smart Security Surveillance

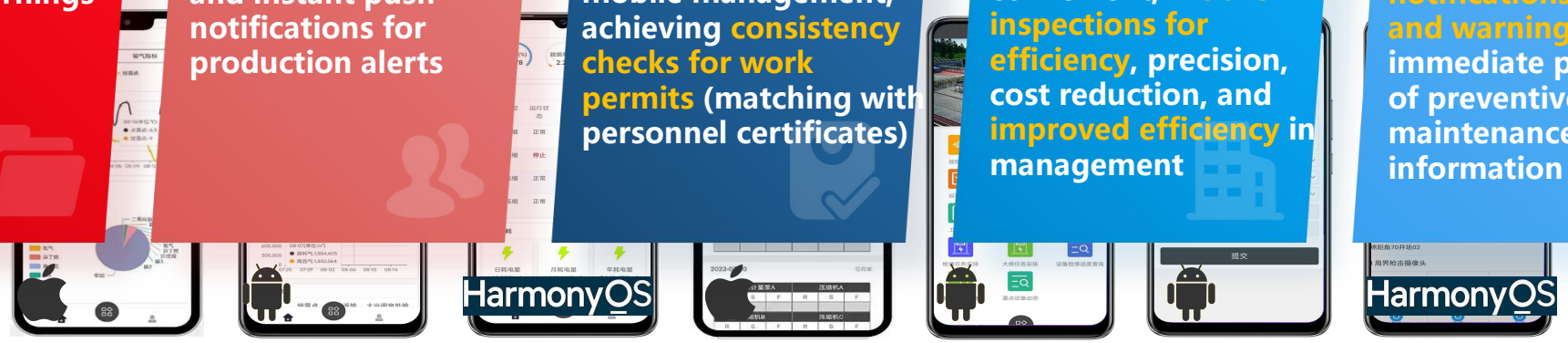
Integration of security video for viewing and real-time push notifications for alarms; risk, hazard, and mobile management; achieving consistency checks for work permits (matching with personnel certificates)

04 Equipment Management

Real-time access to equipment management data, making equipment management more convenient; mobile inspections for efficiency, precision, cost reduction, and improved efficiency in management

05 Online Equipment Monitoring

Achieving online monitoring of equipment operations with real-time data display, instant push notifications for alarms and warnings, and immediate processing of preventive maintenance information



The mobile app supports Android, iOS, and HarmonyOS, ensuring timely and reliable data push notifications

Smart Station — Operational Phase

8) Mobile App Platform

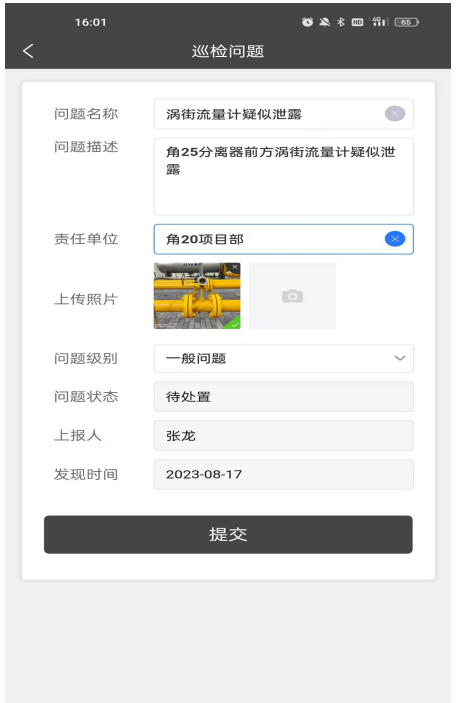
Three-layer Functional Architecture - Efficient Collaboration

Functional development is centered around different levels, mainly addressing the requirements of decision management, supervision management, and operation and maintenance operators

- ***Achieving refined information management;***
- ***Enhancing transparency and flexibility in production operations;***
- ***Optimizing resource allocation, and improving production efficiency;***

Decision Management Layer

On-Site Management Layer



Operation and Maintenance Operators

Ensure the orderly coordination and efficient implementation of production operation goal setting, supervision, and daily operations

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Summary of Project Innovations

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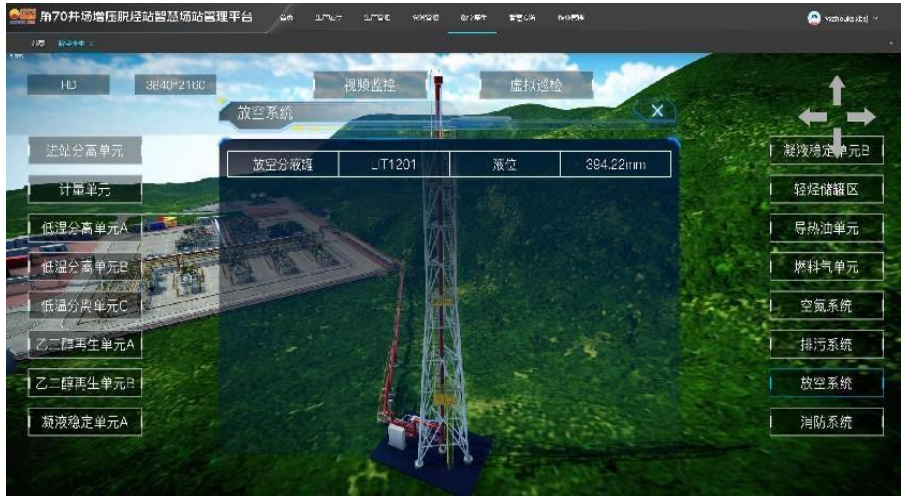
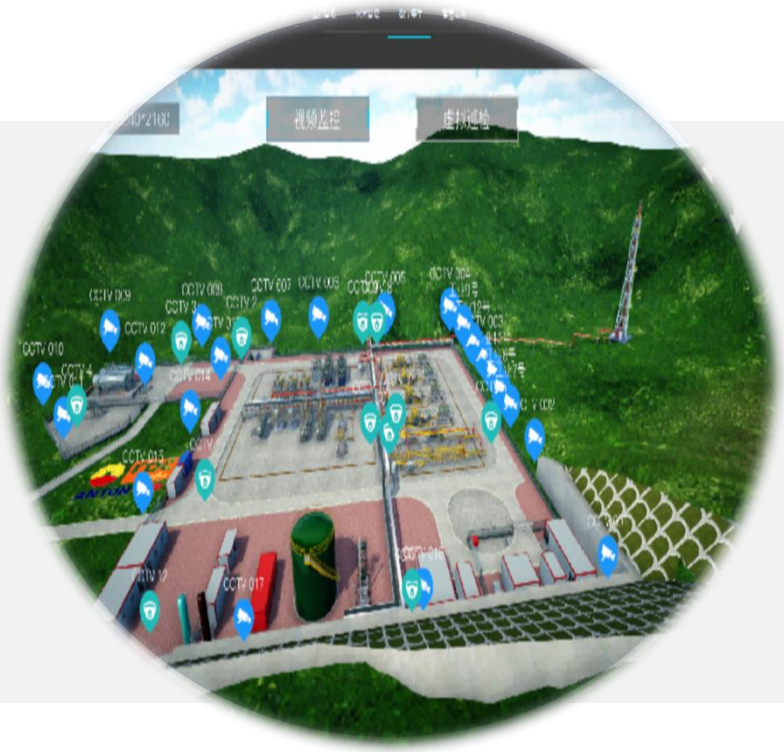
1. **Digital Design and Construction:** The station employs three-dimensional digital tools for design, integrating design and procurement to enhance the three-dimensional model, guiding the construction process
2. **Integrated Control System:** Utilizing automation systems such as DCS, SIS, FGS to ensure production, safety, and fire control, reducing on-site daily operating personnel to 2
3. **Smart AI Security System:** Using AI technology to monitor the station perimeter and production areas, actively detecting issues and notifying management
4. **Intelligent Metering Handover:** Employing intelligent systems for water, hydrocarbon dew point, and chromatographic analysis, combined with an intelligent flow metering system, ensuring automated handover throughout the entire process from raw materials to sales
5. **Smart Production Management:** After completing station construction, achieving intelligent management, including remote monitoring of production, equipment, inspections, safety, and operational processe
6. **Three-dimensional Digital Twin System:** Combining digital design and actual construction to create a three-dimensional digital twin system, showcasing production, inspection, and video monitoring functions in a three-dimensional manner
7. **Mobile App Management:** Providing a mobile application management platform where almost all management functions can be used on the mobile app, not limited to the PC version



Summary of Project Innovations

Customer Value

1. Intelligent assistance in design and construction contributes to safety and efficiency during the construction phase
2. Cloud-based deployment enables remote management from anywhere
3. A management system covering all aspects of the station's operations, eliminating the need for further expansion
4. Intelligent assistance in operations, inspections, and monitoring reduces labor costs



5. Integrated centralized control reduces manual labor intensity
6. Intelligent real-time metering handover reduces handover and verification costs.
7. Three-dimensional visualization systems enhance data readability and usability
8. The system exhibits strong replicability, enabling low-cost and rapid replication for similar stations

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