

Monitoring of harmful substances

Case Study

Project scope

Client: U. S. Steel Košice, s.r.o.
Duration: 10 months
Contract value: 120.000 €



Project overview

The Internal Harmful Substance Monitoring System is designed to protect personnel from harmful gases such as carbon monoxide (CO), hydrogen (H₂), oxygen (O₂) and methane (CH₄). The system monitors these gases inside facilities using a structured three-tier architecture comprising gas detectors, a database server with communication software and client visualization stations. It operates on Windows NT with an Oracle7 database and is powered by Intel-based hardware.



System Architecture

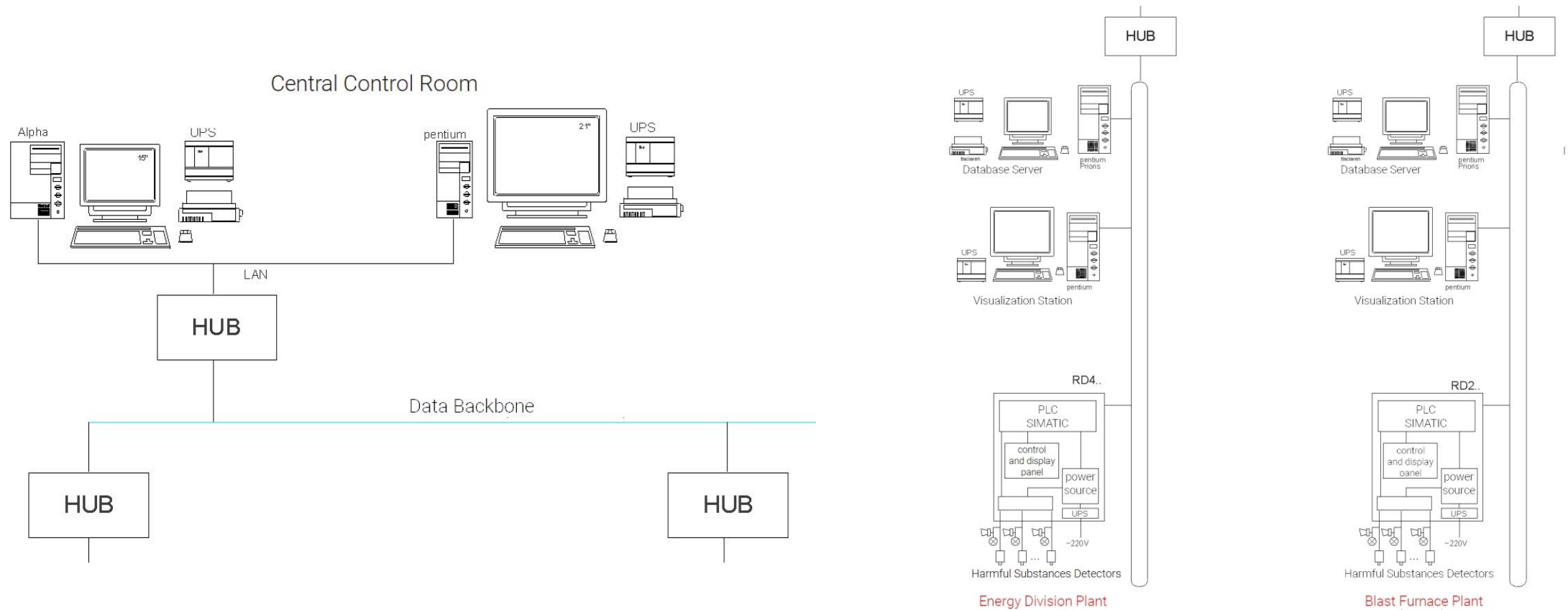
The system consists of three layers:

- + **Lower Layer:** Gas detectors and automation systems (e.g., Simatic S5 PLCs).
- + **Middle Layer:** A database server with communication software.
- + **Upper Layer:** Client workstations providing visualization. Each detector is connected to visual and auditory alarms, ensuring a rapid response in case of hazardous gas levels.

The system tracks concentrations near critical technology areas, ensuring comprehensive protection for employees.



System Architecture



Key Features

- + **Real-Time Monitoring:** Gas concentrations are monitored in real-time via 100 detectors. Data is transmitted from PLC's to the database server over TCP/IP networks. This data is visualized on client workstations, providing an up-to-date overview of gas levels.
 - + **Automatic and Manual Modes:** The system operates in two modes: automatic, where alarms are triggered based on sensor readings and manual, where operators can intervene to control alarms.
 - + **Data Integrity:** The system ensures continuity by allowing detectors to function autonomously, even if communication with the main system fails.
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Visualization and Control

The visualization system is designed to provide detailed, actionable insights:

- + **Graphic Presentation:** The system graphically presents gas concentrations across monitored areas, color-coded for immediate understanding of the situation.
 - + **Alerts and Trends:** Alarms are activated based on preset thresholds and operators can view trends, maximum values, analyze past data.
 - + **User-Friendly Interface:** The system includes drag-and-drop features for ease of use, making it accessible even to operators with basic PC skills.
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Visualization and Control

Vnútorný monitoring (časť Vysoké pece)

Hodnoty Okno Nápoveda

Monitor

Liaci stroj

Rozmrazovňa

42 0 Automatický režim
1 0 Posledné meranie
0 0 21.05.1998 12:21

| Dátum | Čas | Udalosť | Info |
|------------|-------|--|---------|
| 21.05.1998 | 12:21 | Spusteny 1.stupen signalizacie | HA21140 |
| 21.05.1998 | 12:19 | Spusteny 2.stupen signalizacie | HA21140 |
| 21.05.1998 | 12:17 | Chýbny pozadovaný stav alarmove signalizacie | 21 |

Udalosti
Graf
Info

Pripravený ...



Hardware and Software

- + **Servers:** Intel-based servers and clients running on Windows NT.
- + **PLC's:** Simatic S5 PLCs for data collection.
- + **Communication:** Data transmitted over Ethernet via TCP/IP.
- + **Database:** Oracle7 for storing and managing data.
- + **Development Tools:** Microsoft Visual C++ for communication and PowerBuilder for visualization.



Conclusion

This internal monitoring system leverages cost-effective Intel hardware and Oracle database solutions, making it adaptable any company.

Its client-server architecture ensures scalability and efficient operation, while the use of Windows NT and multi-threading capabilities make it a modern, reliable choice for real-time gas monitoring and personnel protection.



ESTEN s.r.o.
Južná trieda 8 (Office Point)
Košice 040 01
Slovak Republic

www.esten.solutions

sales@esten.sk

