



Custody Transfer System for Heat and CO₂ Using GPRS Network Infrastructure

Industry: Power & Environment
Product: STARDOM FCN/FCJ Intelligent RTUs,
FAST/TOOLS SCADA Package

Introduction

The greenhouse effect is increasing the temperature of the earth and poses a global environmental threat. To reduce emissions of carbon dioxide and other greenhouse gases, many countries have ratified the Kyoto Protocol, an international treaty on climate change, and have committed to achieving specific emission reduction targets. To fulfill this commitment, the Ministry of Economic Affairs of the Netherlands is encouraging initiatives that will reduce CO_x emissions approximately 6% by the year 2010. One such initiative came from ENECO Energie, an energy supplier that has its headquarters in The Netherlands. Ten years ago, ENECO Energie built a network of pipelines that distributes heat and CO₂ from one of its power plants to greenhouses. Over time, the custody transfer system linking the greenhouses to a central control room in Rotterdam became outmoded and was no longer adequate: communications via leased telephone lines and a fiber optic link were often disrupted and replacement parts were no longer available. This company has now turned to Yokogawa and its STARDOM and FAST/TOOLS solutions to update and improve the efficiency of the network's custody transfer system.

Expected Benefits

- Secure and cost-effective telecommunications through a GPRS wireless network
- Fully compatible with existing components
- Full web-based capability for conducting maintenance and viewing information via the Internet
- Long-term service assured through a 10 year service contract

About Customer

ENECO Energie is one of the three major energy companies in the Netherlands. The company provides an integrated range of services based on the transportation and supply of electricity, gas and heat, and associated services such as metering, installation, and invoicing. In all, ENECO Energie services some two million business and household customers.

Process Overview

The ROCA power station in Capelle a/d IJssel, The Netherlands, burns gas to generate electricity. This process gives off heat and CO₂, both of which are essential to and highly valued in horticulture. To make full use of this resource, ENECO Energie built a heat and CO₂ pipeline network that connected this power plant to the greenhouses of 138 market gardeners in the Bleiswijk district. To control the transfer quantity of heat and CO₂, a controller was installed in each greenhouse.

Solution Details

After evaluating several vendors, ENECO Energie selected Yokogawa's proposal for replacing the existing heat and CO₂ custody transfer system.

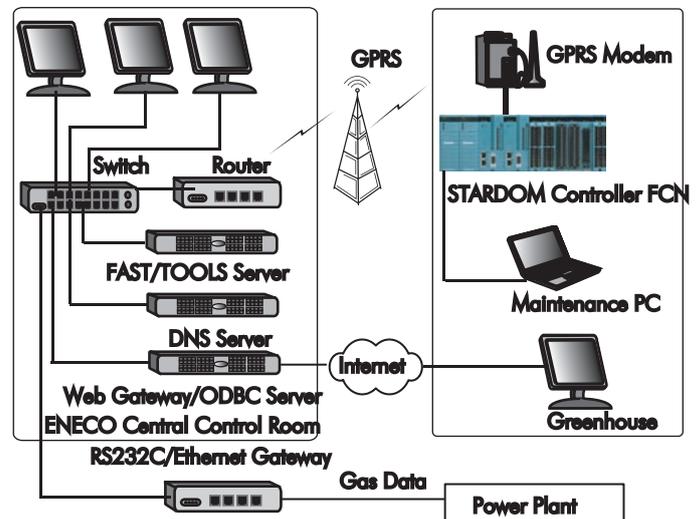


Fig.1 System Configuration

Installed Systems

- FAST/TOOLS as SCADA
- 138 STARDOM FCN controllers as intelligent RTU



Fig.2 STARDOM autonomous controller FCN

Controller on Site

The STARDOM FCN autonomous controllers were installed on site in the existing cabinets to regulate both the heat (temperature and supply) via a heat exchanger and CO₂. All existing field equipment was reconnected to the FCNs and remains in use. Serial ASCII and Modbus RTU protocols are used to communicate with the equipment, and program organization unit (POU) libraries for the Modbus protocols are stored on the FCNs.



Fig.3 FCN on site

SCADA in Central Control Room

The data acquisition and control functions are handled by FAST/TOOLS in a central control room.

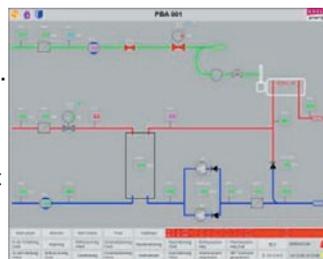


Fig.4 SCADA Window

Communication Method

The global system for mobile communications (GSM) was first used in mobile telephony, and is now being used in various industries to exchange data.

General Packet Radio Service (GPRS), an extension of GSM, allows packet data transfer. The advantage of GPRS is that equipment is always connected to the network but communication fees are charged based on the volume of data traffic, thereby ensuring stable wireless communications at relatively high speeds and at a reasonable cost. However, there were several obstacles to overcome when using this technology:

1. PPP capability

The equipment connected with the GPRS modems needed to be capable of establishing a point-to-point protocol (PPP) connection for dial-up access via a telephone line. The Java function of the STARDOM controllers, which employ a PC architecture, enables the establishment of a PPP connection.

2. IP address acquisition

When a connection is established, a device communicates with other devices based on an IP address. An IP address is therefore required to identify each device. This could be resolved by using a fixed IP service, but that costs more. To overcome this obstacle, each controller sends the dynamic IP address information assigned by the service provider to the SCADA system, which has a fixed IP address. By employing this mechanism, the individual STARDOM controllers do not need fixed IP addresses and total cost can be kept down.

3. Network Failover

The wireless custody transfer system has to be secure in the event of network failure. The SCADA system continuously acquires all transfer amount data, and this data is also backed up by the controllers. At network failure recovery, the SCADA loads the data that has been backed up by the controllers.

4. Report by Exception

Since GPRS communication fees are charged according to the volume of data traffic, constant data polling from the SCADA side is not suitable. To reduce communications fees, the system employs a report by exception communication method in which data is sent from the controller side only when it is changed.

Local HMI on Site

Local service personnel can view maintenance information on site by accessing a web browser – there is no need to install other software for maintenance.

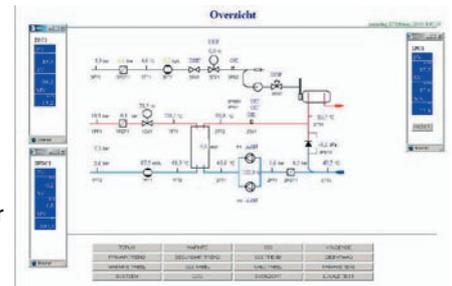


Fig.5 Maintenance Window on IE

Web Site

The FAST/TOOLS package that performs data acquisition and control functions from the central control room features a web-based implementation that enables a standard browser to be used as the control system interface. FAST/TOOLS also provides a link to the ENECO web site.

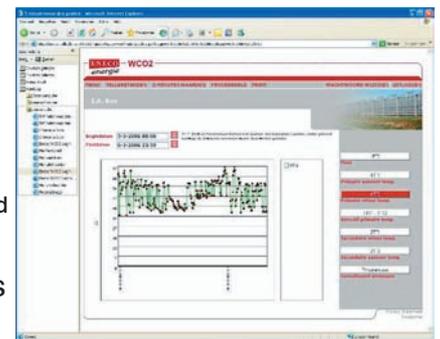


Fig.6 ENECO Energie Web Site

The market gardeners can log in to this site to order heat and CO₂ online and view a number of important parameters related to the functioning of their own delivery station.

Conclusion

Yokogawa ensures a reliable heat and CO₂ transfer system by using the standard GPRS protocol. The exclusive use of web-based technology enables the market gardeners to go online to order heat and CO₂ and view information, reducing their workload and eliminating the cost of installing special-purpose software at each site. In summary, the following benefits were achieved:

- Reduction of initial installation and running costs by using the standard GPRS network protocol
- Reduction of initial installation costs by adapting the new systems to existing components
- Low-cost expansion with reusable application embedded onto controllers