



Shaofeng Hou



Xin Huang

New automation, security, and remote management technologies allow pipeline engineers thousands of kilometers apart to collaborate effectively. >>

Remote Management Secures Vital Gas Pipeline

By Shaofeng Hou, Solution Architect, Energy Solution Department, Huawei Enterprise Business Group and Xin Huang, Solution Sales Manager of Oil & Gas Industry, Central Asia Solution Sales Department, Huawei Enterprise Business Group

The Central Asia-China Gas Pipeline was built and is operated by Asia Gas Pipeline (AGP) LLP, a joint venture between China National Petroleum Corporation (CNPC) and KazMunaiGas, Kazakhstan's state-owned oil and gas company. Consisting of three parallel gas lines, the pipeline stretches 1,833 km from the Amu Darya River, separating Turkmenistan and Uzbekistan, to the western Chinese border town of Horgos.

With a pipe diameter of 1,067 mm each, and a combined delivery capacity of 30 billion cubic meters per annum, Lines A and B became operational in December 2009 and October 2010, respectively. For Line C, with a 1,219 mm pipe diameter and a delivery capacity of 25 billion cubic meters per annum, construction began in 2012 and came online in 2014.

The 55 billion cubic meters combined capacity is approximately 20 percent of China's annual natural gas consumption and provides the equivalent energy of 73 million tons of standard coal. The use of natural gas rather than coal will eliminate 78 million tons of carbon dioxide and 1.21 tons of sulfur dioxide emissions every year. This enormous capacity has created a billion-dollar marketplace for trading natural gas to China from its neighbors to the West.

The more recent construction of Line C, provided an opportunity to incorporate the most advanced communications technology for remote command and control.



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Together, KazStroyService Ltd. and Huawei proposed an open, multi-vendor, end-to-end broadband communications platform for voice, data, and video feeds for command and control, monitoring, and security systems.

built along with the pipeline using the most advanced automation technologies available. A state-of-the-art operation would be assured from the start.

Given the remote, rugged terrain, difficult climate, and demanding security requirements, construction of the Kazakhstan-China gas pipeline would not be easy, and, once operational, routine on-site inspections would be few and far between. AGP required a broadband communications system accessible from many terminal types for real-time analysis, effective troubleshooting, and support for a comprehen-

Secure, Automated Pipe

During pipeline construction, AGP decided that the information infrastructure, including a communications network and Supervisory Control and Data Acquisition (SCADA) system, would be

sive security management system to quickly neutralize threats of theft, sabotage, and other “forces majeures.”

Building an Intelligent Pipeline

A system integrator was needed with responsibility for managing the communications and SCADA systems.

Together, KazStroyService Ltd. (KSS) — an Almaty, Kazakhstan-based engineering, procurement, and construction company — and Huawei proposed an open, multi-vendor, end-to-end broadband communications platform for voice, data, and video feeds for command and control, monitoring, and security systems.

KSS and Huawei won the bid to deliver this solution in June 2010.

• Building an Intelligent Pipeline

A fiber-optic network with satellite backup was deployed using an all-IP infrastructure. For terrestrial transmission, optical trunk cables were deployed alongside pipelines. The satellite communications system provides link redundancy to the Almaty Control Center (ACC) from five

pumping stations, two monitoring stations, and thirty-three valve stations.

To protect the terrestrial network, the optical plant is a typical Synchronous Digital Hierarchy (SDH) ring topology. If the optical circuits ever go offline, critical SCADA and emergency voice circuits are routed to the emergency satellite backup. The failover time is 50 milliseconds, and is invoked by protection circuits at the board, device, and system levels.

• Inter-Station Communications

Huawei developed a custom communications system for the control centers, pumping stations, and valve stations. An IP-Private Branch Exchange (IP-PBX) voice system and videoconferencing system were deployed over a low-latency, high bandwidth trunking system for routine communications during production operations.

To protect pipeline and station equipment from damage or theft, ensure personnel safety, and respond rapidly to production accidents, Huawei deployed an Intelligent Video Surveillance (IVS) system and Intrusion Detection System (IDS) that includes a station access control system and industrial-grade broadcast system. The IDS system and access control system are linked at key points with the IVS system so that security staff is able to receive and respond to alarms as quickly as possible.

Huawei also provided a comprehensive security defense management platform to reduce Operations and Maintenance (O&M) complexity and associated costs by interworking with third-party IVS systems.

• Remote System Management

With Huawei's help, the Kazakhstan-China gas pipeline implements a true end-to-end communications system, featuring redundant transmission links and a visualized control management interface for uninterrupted communications and “anytime, anywhere” access.

In 2013, the communication system deployed by Huawei for the first section of the Kazakhstan-China natural gas pipeline (AGP-A & B line) passed acceptance testing and was put into operation — and has now operated for more than two years without incident. The remote control and

communications systems for the pipeline stations ensure that alarms from Kazakhstan are monitored from as far away as Beijing by audible alert, SMS, and/or email.

The communications alert system has been built to pinpoint preventative maintenance activities and detect latent problems early enough to reduce or eliminate the extra costs that occur in the event of a full-scale crisis.

As the monitoring center for the entire pipeline, the ACC receives, processes, and summarizes data collected over the pipeline communications channels, including the data generated by the SCADA system. Assisted by an integrated security management system, the A & B pipeline operations team, located in control stations separated by thousands of kilometers, use Huawei's cross-platform integrated Network Management System (NMS) to monitor pipeline status in real time. The NMS also offers fully automated analysis and statistics systems for visibility into the pipeline's operating status, assisting pipeline managers to head off latent issues.

3rd of Three

The design, procurement, and construction of the communications system for Line C of the Central Asia-China Gas Pipeline are currently underway by Huawei. Upon completion in 2016, AGP will enjoy having the latest-generation digital communications solution to provide remote real-time monitoring, uniform data transmission, and management services for all the stations along Lines A, B, and C of the pipeline, making for a secure, stable, and efficient “artery of energy” across the Asian continent. ▲

In 2013, the communication system deployed by Huawei for the A & B sections of the pipeline passed acceptance testing and was put into operation — and has now operated for more than two years without incident.

