

## CALENDAR

■ **INDABA 2006: 12th South African Conference on Coal Science & Technology**

October 10–11, 2006  
Glenhove Conference Centre  
Melrose, Johannesburg, South Africa  
e-mail: heather@aquaoorange.co.za

■ **VII Seminario Minero Internacional**

October 17–20, 2006  
Expo Forum Convention Center  
Hermosillo, Sonora, Mexico  
e-mail: mminero@amsac.com.mx

■ **Mining 2006 Resources Convention**

November 1–3, 2006  
Hilton Brisbane Hotel  
Brisbane, Australia  
e-mail: abbie@verticalevents.com.au

■ **MineWest '06: Managing The Boom**

November 8–9, 2006  
Colorado Convention Center  
Denver, Colorado  
e-mail: cdorn@mining-media.com

■ **Mines and Money 2006**

November 20–22, 2006  
Hilton London  
London, England, United Kingdom  
e-mail: eileen.smith@mining-journal.com

■ **Runge North American Professional Development Courses**

**Dragline Mining Systems**

Denver: Sept. 27–28

**Mining Economics**

Denver: Sept. 21–22    Calgary: Sept. 25–26

**Mining for Non Miners**

Calgary: Sept. 15    Denver: Sept. 29

**Truck & Loader**

Calgary: Sept. 18–20    Denver: Oct. 2–4

For additional information or to register,  
please contact Marcie Schmidt at  
403-217-4981 or mschmidt@runge.com.au

## Successful Mine Development - Know Thy People - Develop Thy People

### Introduction

Mining projects depend on a number of factors to be successful including a high quality mineral resource, sufficient capital investment, good planning, a positive business climate, community support, and an effective organization with skilled people. The importance of an effective organization with skilled people cannot be over emphasized. Mining is a very capital intensive business, but also a very people intensive business. An effective organization with skilled and motivated personnel is critical to a successful mining project. This article describes the development of a large overseas coal mine. The author was directly involved in mine management for 6 ½ years during the initial mine startup and early years of production. It emphasizes the steps taken to ensure development of an effective organization composed of skilled people from both the area near the mine and elsewhere within the country. It also discusses actions taken to ensure a positive business climate with local and federal governments. Developing community support, a skilled work force, and an effective organization all contributed significantly to the project becoming a world class mine operation.

### Government Partner

The project was jointly developed by the government owned national mining company, which owned the reserves, and the mining subsidiary of a large multi-national corporation, which was the operator. The government had initially accepted the operator's bid because it presented the most attractive overall conditions, including a 15 percent royalty on the operator's share of production and an additional bonus royalty on that portion of the operator's before-tax profit in excess of 35 percent of cumulative investment. The operator's parent had over 50 years of experience in the country. Worldwide it had been responsible for the development and construction of many major facilities. As a result, the government was comfortable with the multi-national and trusted its management.

The association contract clearly stated the government owned the reserves. The multinational was the operating partner. Each partner had a 50 percent participation in the mine operation. The contract outlined three stages of project development. The first stage, exploration, was to last a maximum of four years. The operator was responsible

for all exploration costs and the data was shared with the government. The second stage, development, was to last up to 6 years or when the first product was shipped. Development costs were shared equally by both partners. The third stage was the mine operational phase. At the conclusion of this phase, approximately 25 years after product shipments commenced, the government would assume 100 percent ownership and control of the entire project.

The association contract called for the formation of an executive committee consisting of an equal number of government and operator representatives. The executive committee was responsible for approving all policies, budgets, and expenditures relating to the project.

Infrastructure requirements were sizeable. The mine area is semi-arid, sparsely populated, and located far from major population and industrial centers. Before construction, the area was devoid of any industrial, transportation, or communication infrastructure. The project required the construction of a port, railroad and road to connect the mine and the port, housing, two airports, and training facilities for mine employees.

### **Socio-Economic-Cultural Focus**

Government objectives for the project included socio-economic

development of this remote area. Transfer of technology to nationals and maximum use of national goods and services in both mine construction and operation were also high priorities.

A detailed socio-economic-cultural study was made of the area including the mine, railroad, and port. A sizeable indigenous population lived between the mine and the port. Its culture was based on clans and the nuclear matriarchal line of descent. Any violation of cultural norms was punished based on revenge or payment-in-kind.

In addition to the indigenous population, another portion of the areas' population was a mix of the indigenous people with others from various parts of the country or neighboring countries. A third segment was non-indigenous persons of European, African, and Arab descent. The socio-economic-cultural study played an important role in understanding the different values and norms of the three different cultures.

The project made a focused effort to provide the local communities with improved medical support through investments in infrastructure and access to skilled doctors. Emphasis was also placed on improving the educational infrastructure.

### **Challenges Facing Project**

The project attracted considerable attention in the country because the government was one of the partners. However, because the

mine was being built in a country having no prior experience with projects of such magnitude, the operator faced a number of challenges: the need to understand and comply with the local laws and regulations; the need to identify and assess the resources and expertise available locally; difficulties in adapting designs to local conditions and the use of local materials; and difficulties experienced by some subcontractors in meeting stringent schedule and quality requirements. Over 11,000 people (9,000 field personnel) were involved in the construction.

Because the country lacked a modern mining industry, one of the biggest challenges facing the project was finding and training an adequate workforce for the long term operation of the mine. Specifically, trained equipment operators and equipment maintenance personnel were critical for the success of the project. The operator made a focused effort to hire local people. The first priority was to hire from the Department (State) where the mine was located. The second priority was to hire from the area of the nearest largest city (approximately 1 million people). The third priority was to hire from elsewhere in the country. Trainees had to be high school graduates (a special achievement in the country) and had to pass an employment exam prior to being hired.

### **Personnel Development**

Since the population did not have mine related operating and

maintenance skills, the operator established programs to provide the extensive training necessary. Since the mine was very isolated, the operator originally planned for it to be totally self-sufficient with all parts rebuilding and equipment over-hauls to be done by the mine staff. This approach was later modified in favor of a more diversified approach that could take advantage of and develop local representatives of the original equipment manufactures. Despite this modification, many rebuilds and major overhauls were done with company personnel.

To meet full production requirements after five years, the project needed over 1,000 equipment operators and 1,200 maintenance mechanics. As part of the overburden removal program, the operator initiated a series of three month, on-the-job training cycles for equipment operators on site. This program evolved into an ongoing program at the mine for the field training of operators. Maintenance technicians were placed in a three year training program. As a part of this program, a \$4 million school was built in the largest city near the site.

The operating company's program meshed with existing government maintenance apprenticeship programs. Students hired for the company program were usually graduates of the government programs. Company instructors were generally nationals of a supervisory rank. Students were trained as heavy-duty mechanics, light vehicle

mechanics, plant mechanics, electricians, electronics technicians, welders, or machinists. Training for each area was designed on a module basis. For a heavy equipment mechanic, for example, learning was broken down into such elements as hydraulic systems, electrical systems, transmissions, and electronics.

The operator also had a parallel operation that recruited recent national college graduates and trained them for professional level positions. A reasonable percentage of these professionals were English speaking engineers, some of whom had completed masters degrees at respected U.S. and Canadian universities. Because they were able to bridge the language difference between the expatriates and the nationals, the English speaking technical people were of great assistance in the early development of the project at all levels. These young bi-lingual technical people played a key role in getting the project off to a good start by facilitating clear communication. They helped provide on-the-job language training for the expatriate supervisors. Because they had lived in the U.S. or Canada, they understood and appreciated how and why the expatriates approached the nationals' training in the way they did.

### **Integration of Non-Operating Partner**

To build trust with the non-operating government partner, the operator allowed government

company representatives to observe the planning and decision making activities within the major operating departments. Technical individuals from the government mining company with the appropriate background were later placed in operating jobs, allowing them to become part of day to day operations. This allowed the non operating partner to receive timely, accurate, and informal information. This openness facilitated complex decision making, as informal questions could easily be asked and studied in advance of the formal review process and executive committee votes. In the majority of cases, proposed plans or expenditures were agreed upon prior to going to the joint owners for approval.

### **Mine Community**

The operator initially planned to have no mine community but, rather, to operate a fly-in and fly-out program using a fleet of 727 jets to fly the three hours from the capital city to the mine. This evolved into a fly-in and fly-out program from the largest city near the mine, a one hour flight by four engine prop plane. Management, technical and administrative staff worked a four in and four out schedule.

Originally the operation had two people for each major operating management position, i.e., General Superintendent and Assistant General Superintendent. The schedule, combined with the necessity to stagger work schedules

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over the eight day cycle to even out the load requirements of the airplanes, meant the management staff on site was changing daily. It became apparent that this schedule was inefficient. Eventually, the operator decided there needed to be a community at the mine site where the mine management lived. The community eventually grew to over 400 families and included a school for 900 children. Because having a community at the mine turned out to be a more efficient method to manage the operation, this community still exists today.

### **Supervisor Training**

Experienced expatriate senior supervisors were assigned to each operational shift and major shop at the mine, railroad, and port. One of the primary goals of these supervisors was to train and develop front line supervisors and the mechanics. In order to do so, they needed not only knowledge of technical subjects, but also the

ability to teach and gain the respect of the national personnel. Their willingness to learn the local language and develop appreciation and respect for local customs were critical to the ultimate goal of training nationals to eventually take over the management of the business.

Although the supervisors received basic training originally, the operator recognized after approximately three years of development and some modest early production that additional training was required to raise the skill level of the supervisors. It developed a comprehensive training program for front line supervisors with two major objectives. The first of these objectives was to improve the overall safety record by improving the knowledge and skill of the supervisors. The second objective was to provide each supervisor with an appreciation of how his decisions affected the mine as a whole by providing an overview of each

department. This program had positive short and long term impacts.

### **Conclusion**

Development of successful mining operations, in part, depends on well trained local personnel. The projects need support from the various levels of government and the communities in which the mine operates. The availability of skilled local personnel will in many cases depend on well thought out training programs developed and supported by the mine operations. Government and community support are key elements to success and they can be obtained when the mine project ensures that the government and community can see the tangible benefits of the operation.

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