

**VOCATIONAL TRAINING PROGRAMME
IN THE
TURKISH HARD COAL MINING SECTOR**

**TÜRKİYE TAŞKÖMÜRÜ KURUMUNDA YÜRÜTÜLEN
HİZMETİÇİ EĞİTİM PROGRAMI**

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ABSTRACT

This paper explains the aims, methodology and achievements of a 3.4 million ECU European Union-funded vocational training project carried out by International Mining Consultants (IMC) over a 15 month period starting January 1997 within Türkiye Taşkömürü Kurumu (TTK). It records the details of the rehabilitation of the Mining Training Centre in Zonguldak; the implementation of a number of specific mining training courses; the training throughput achieved jointly by IMC and TTK and the sustainability measures of the project.

ÖZET

Bu makalede, 15 ayı aşkın süredir - Ocak 1997 tarihinden bu yana Türkiye Taşkömürü Kurumu (TTK) bünyesinde, 3.4 milyon ECU Avrupa Birliği desteğiyle International Mining Consultants (Uluslararası Madencilik Danışmanlığı) IMC tarafından yürütülmekte olan Mesleki Eğitim Projesinin amaçları, metodolojisi ve sonuçları anlatılmaktadır. Ayrıca, bu yazıda Zonguldak Madencilik Eğitim Merkezi rehabilite çalışmaları, belirli sayıda özel madencilik eğitim kursları, ve IMC ve TTK işbirliğiyle yürütülen eğitim programlarının getirilen ile projenin devamlılık ölçülerine ilişkin bilgiler bulunmaktadır.

1.0 INTRODUCTION

In 1989 an agreement was concluded between Turkey and the European Union for financial aid to support vocational training in the mining and tourism sectors in Turkey. In the mining sector the aid was directly targeted at the hard coal industry managed by the state-owned enterprise Türkiye Taşkömürü Kurumu(TTK).

TTK's production is concentrated on the Black Sea coast near Zonguldak and the outlying regions of Amasra and Armutçuk. In 1997 TTK employed 19,030 people of which 13,052 worked underground. In 1997 TTK produced 2.3 million tonnes of saleable coal at an average of 0.5 tonnes per manshift. Production is geared mainly for energy generation plants(68%),steel works(15%), light industry and household sales.

Mining conditions in all three areas are very difficult with seam inclinations between 0-90°. Mechanisation of the working faces therefore, is limited to hydraulic props and steel link bars and chain conveyors or, in the steeper sections, simple steel chutes. Most of the current 46 longwalls are supported with timber and there are two longwalls supported with hydraulic props and steel link bars with a further 5 similarly equipped face planned. High pressure compressed air blasting is carried out in the steeper sections at three mines close to Zonguldak. Roadway development drivages consist of electro-hydraulic drill rigs and bucket loaders for main access roads. Conventional drill and blast systems will continue for the foreseeable future. Faces are developed by hand-got methods, typically drill and fire. Mineral and material transport is accomplished mainly by battery locomotive and small belt conveyors. The combination of low levels of coal face mechanisation and difficult mining conditions creates low productivity. Due to the mining circumstances TTK employ a comparatively high labour force and suffer from high accident rates. Between 1989 and 1993 TTK spent 68.5 m\$ of World Bank loans in order to rehabilitate ASMA, GELİK and KENDİLİ mines. The introduction of new equipment obviously required new skills and persons trained to operate and maintain the equipment. **The principle aim of the EIL-funded Vocational Training Programme therefore was to introduce safer and more efficient methods and approaches to normal working practices through up-skilling particular sections of the workforce whilst refreshing existing skills of supervisors, engineers and management.**

2.0 TRAINING NEEDS ASSESSMENT

A Training Needs Assessment¹ was carried out in 1994 by a European Training Expert who identified the rationale and priority for training within TTK within the financial scope of the agreement and tempered by existing training policies within TTK. A number of important training needs emerged from this report;

- to increase the skills of the workforce in the installation, operation and maintenance of the new equipment(purchased under World Bank loans) so that it can be used safely to better effect and so continue the process of improvement;
- to rebuild the level of skills and knowledge in the existing mining, mechanical and electrical equipment;

- to put in place within TTK the ability to develop, implement and teach new curriculum through the training of the existing TTK trainers in course design and training techniques;
- to increase safety through increasing individual's skill level in:
 - => roof support on long wall faces and the use of hydraulic props;
 - => the transport and handling of materials
 - => locomotive operations and related track maintenance
 - => the recognition of inherent dangers associated with electrical, mechanical and transport systems;
 - => positioning themselves in a place of safety during operations so that if accidents do occur the worst consequences can be avoided.

To meet the above needs the Report specified;

- 16 vocational training courses for different categories of the workforce
- Training Techniques courses for 42 mine-based engineers and Training Centre permanent staff •
- a series of Mechanisation Seminars for middle management.

The Report also identified the existing conditions of the Training Centre and mine gallery and identified necessary improvements which would need to be carried out before training could commence.

From the foregoing the specification of additional equipment for the Training Centre and training consultancy was produced and tenders issued.

3.0 CONTRACT AWARDS

IMC successfully tendered for the comprehensive vocational training programme which was to be carried out in the Training Centre in Zonguldak. Funds for the training consultancy element amounted to 12 million ECU's(1.5 million US dollars equivalent) along with an equipment spend of 2.04 million ECU's(3.5 million US dollars). The equipment was purchased under competitive tender from EU countries and Turkey and deliveries were completed during 1996.

The equipment and supply source for the Training Gallery comprised the following items;

1. Track-mounted electro-hydraulic drilling machine -Deilmann Hanniel
2. Track-mounted electro-hydraulic bucket loader- Deilmann Hanniel
3. Single centre strand chain conveyor - CdFI SA
4. Hydraulic supports(open circuit type) - CdFI SA
5. Steel link bars - CdFI SA
6. Battery locomotive and charging equipment - Clayton
7. Electrical switchgear - CdFI SA
8. Signalling and communications system - CdFI SA

9. 1 100v underground transformer - CdFI SA
10. Complete hydraulics/pneumatics laboratory - FESTO

The equipment and supply source for the Training Centre comprised normal classroom furniture, computers, laser printers, an LCD projector, overhead projectors, white boards and drop screens.

4.0 PROJECT PHASES

4.1 Inception phase

The contract between IMC and TTK became effective as from 1 January 1997 and IMC's first action was to conduct an investigation within TTK to test the validity of the original terms of reference i.e. confirmation whether the original vocational training courses were still appropriate to TTK's needs. This was necessary since the original training needs was determined some 3 years earlier and TTK's workforce had reduced by almost 9,000 in the intervening period. This process took three weeks to establish through a series of meetings, mine visits and a workshop session with senior TTK management. It confirmed that all of the vocational courses were still necessary however IMC also proposed refinements to the original training programme; viz:

- three courses which related to bucket loader and drilling machine operations and roadway support safety should be combined into one comprehensive course
- a series of Management seminars as well as the Technical seminars would be appropriate
- most of the French-supplied electrical switch gear (starter motors, lighting transformers and gate-end boxes) should be exchanged for British-supplied switch gear available from operating units. The training mine would simulate actual underground conditions particularly in view that British-supplied switch gear is in widespread use within TTK mines)
- two tranches of Training Techniques courses to be staggered within the programme; one immediately before the vocational courses were run and another mid-way through the programme
- a new mock coal face should be excavated in the gallery
- a locomotive skid control circuit should be constructed close to the Training Centre

All refinements were discussed with the Project Monitoring Group and agreed.

4.2 Installation phase

This phase covered a three month period and involved rehabilitation of the mining gallery, training classrooms and installation of the equipment in the gallery and training rooms under the guidance of three IMC consultant engineers, one mining, one electrical and one mechanical with selected counterpart engineers. The training gallery was established in 1964 from a section of a disused mine which was abandoned in 1920. A plan of the gallery is shown in Figure 1.

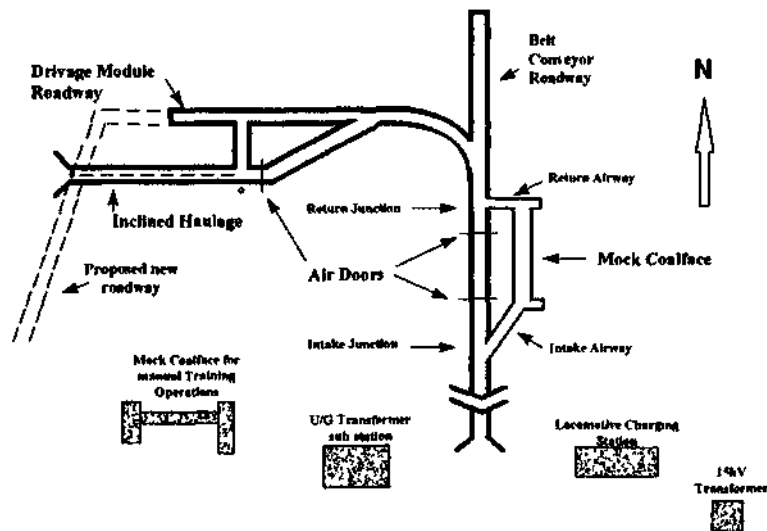


Figure 1. Training Gallery Layout

Briefly, it consists of a straight horizontal section at ground level for 150 metres leading to a curve in the roadway and a 'blind heading'. Under IMC's supervision a new drivage was made on the right flank of the 150 metre straight section to create a mock coal face which would be used for training face operators in mechanised coal face operations. This drivage was blasted from sandstone and took ten weeks to complete using experienced heading workers from Kozlu and Uzulmez mines. The face is supported with hydraulic props and steel link bars. A chain conveyor with advancing/retracting push cylinders was installed on the face along with a complete communications/pre-start warning and signalling system. A belt conveyor was installed in the blind heading for the purpose of demonstrating the hazards of stored mechanical energy. The curve leads to another split to the left where a 50 degree rising incline is used for haulage training. The straight on section is used for the practical drivage training using the bucket loader, drilling machine and a monorail mounted chain conveyor.

The gallery had a domestic electrical supply so the TTK High Voltage Energy Division was requested to assist in providing a higher voltage feed. In response they generously provided a 15,000 Volt transformer, pylons and suitable cabling and installed the entire system themselves on a prepared concrete plinth. This installation highlighted the excellent co-operation between TTK and IMC. Simultaneously, a sub-station was constructed to accommodate the underground transformer, circuit breakers and associated switch gear which, with other switch gear in the gallery, would be used to train mine electricians in electrical safety. Other work completed outside and adjacent to the gallery included a locomotive battery charging and changing station, a pump house which accommodated the high pressure hydraulic pump for operating the mock coal face supports. A dummy shotfiring board was installed at one end of the external mock coal face for shotfiring refresher training (methane detection equipment for this course is located at the nearby Safety Department building). The external mock coal

face is used to train operators in conventional timber supported longwall work. 150 metres of new track, switches and buffer stops was laid outside of the gallery and the internal track work was re-laid to a high standard ready for the track laying course and locomotive safety and driving course.

4.2.1 Mining gallery enhancements

Other improvements were made by TTK after the installation phase was completed and as equipment became available. This additional enhancement work included the installation of compressed air - operated doors in the gallery, an overhaul of the air compressor, installation of ventilation fans and renewal of ventilation doors, rehabilitation of rooms to provide a secure storeroom, bathing and changing rooms and lamp room. Another building was rehabilitated to become a rest room for trainers working at the Gallery. A second battery locomotive and a diesel locomotive was provided by TTK for use at the Gallery. A long overdue spring clean was carried out and a liberal amount of paint was used to complete the transformation of the underground gallery and classroom facility into a Training Centre of European class standards. TTK also accepted IMC's recommendation to construct a locomotive skid control circuit adjacent to the Training Gallery and this work was completed in March 1998. This layout enhances the locomotive safety course by training locomotive drivers how to stop a locomotive in an emergency situation safely and effectively.

4.3 Training Centre Improvements

The Training Centre comprises two main buildings, one which fulfils the administration function and the second which is a three storey training building. This building includes a large conference room, 10 large training rooms, an hydraulics laboratory and a refectory. IMC occupied the top floor which was renovated to create three consulting work stations, a Project Manager's office, two trainers lounges and a secretarial office. Each of the rooms have a proportion of the 150 modern tables and swivel chairs purchased from the Project funds. TTK purchased and installed air-conditioning units, a water heater for the shower room, an international telephone line and fax facility.

4.4 Training Implementation Phase

TTK have maintained their own training programme for many years, some of which involve training at mines themselves. These courses have been reinforced by the new approaches using IMC's modular training courses. The courses and duration which were specified in the contract were,

- Training Techniques Courses(four in total) (5 days)
- Basic Hydraulics/Pneumatics (10 days)
- Hydraulic/Pneumatic Safety(3 days)
- Electro-Hydraulic Systems(5 days)
- Coal Face Support(2 days)
- Mining Safety Refresher(4 days)
- Blasting Safety Refresher(2 days)
- Track Laying(2 days)

- Locomotive Safety(3 days)
- Locomotive Driving Refresher(5 days)
- Roadway Drivage(5 days)
- Mechanical Safety(5 days)
- Electrical Safety(5 days)
- Loading machine maintenance^ days)
- Drilling machine maintenance^ days)

Consultation between IMC and TTK led to a course schedule being devised which promoted mine safety as a priority hence those courses which featured safety were brought in early in the schedule. Since the hydraulics laboratory was set up and independent of other courses it was logical to commence early training in basic hydraulics and pneumatics

4.5 Training Methodology

Each the vocational courses were scheduled to be produced and delivered in a six week period . Generally a course would comprise a maximum of eight trainees thus allowing a more interactive "hands on" approach to training. The methodology adopted was accomplished in five stages as in Figure 2.

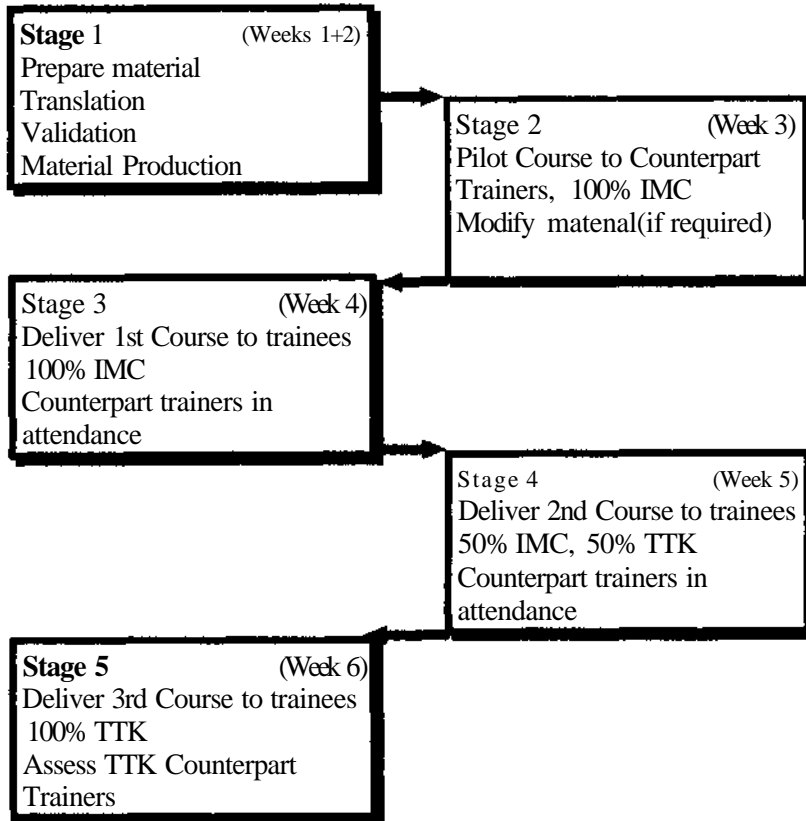


Figure 2 Training Stages

- Stage 1** IMC's consultant trainer would develop the training material on computer for use with an LCD projector. Once the material was prepared it would be passed to IMC's translator who would translate the material into Turkish. During translation confirmation of terminology would be validated by the counterpart TTK trainer(s) thus eradicating possible translation errors. Note, IMC's translators were contracted from the British Council in Ankara. This stage would take two weeks to complete.
- Stage 2** Once the material was completed in both English and Turkish, a pilot course would be run in Week 3 for the counterpart trainers only. This course would be given by the IMC trainer in English with sequential translation into Turkish.
- Stage 3** A second course would be held in Week 4 to a group of trainees supplied from local mines. This course would also be delivered by the IMC trainers in English with sequential translation into Turkish.
- Stage 4** A third course would be held in Week 5 to a new group of trainees, however this would be conducted in English and Turkish on a 50:50 basis whereby the TTK counterpart trainers would deliver half of the course in Turkish and the IMC trainers would deliver the other half in English.
- Stage 5** A fourth course would be held in Week 6 to another new group of trainees with all session subjects delivered entirely by the TTK counterpart trainers. During this week the IMC trainees would assess the ability of the TTK trainer(s) to successfully deliver the course.

5.0 TRAINING THROUGHPUT

A total of 140 training courses have been run as shown below with attendees for each element/course shown in Table 1. Vocational course attendance details are shown in Figure 3. TTK trained 64% of the vocational course members themselves.

Project Training Element	Number	Course Attendees*
Training techniques	4	42
Technical Seminars	4	99
Management Seminars	4	75
Vocational courses	124	857
Computer Courses	4	36
Total	140	1109

Table 1 - Total Course Attendance *up to 31 March 1998

TTK-IMC TRAINING COURSES ATTENDANCE CHART

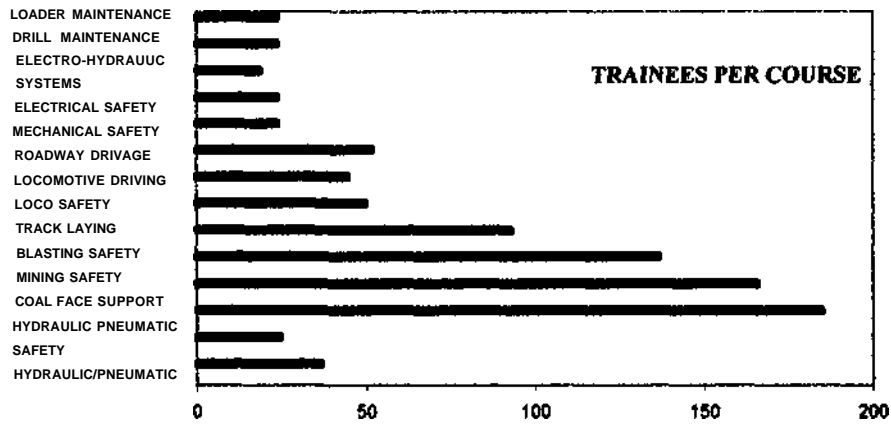


Figure 2 - Vocational Course attendance

6.0 PROJECT ASSESSMENT

As part of IMC's training quality assurance strategy the Project was managed by a resident Project Manager and regularly reviewed by senior IMC training specialists at three monthly intervals. There was also periodic Project Director review meetings both in the UK and in Zonguldak. This approach established a good liaison between IMC, TTK and the EU. It also helped to consolidate the objectives of the project and ensure all contractual requirements were met in full. Each visit by the training specialists resulted in a Project Interim Report(of which there were four) which was produced in English and Turkish as was the Inception Report and Final Report. TTK formed a Project Evaluation Committee who considered and approved the Reports before they were sent to EU Ankara.

7.0 SUSTAINABILITY

It is important that the training activities continue indefinitely after the consultancy service ends so that TTK obtain maximum benefit by up-skilling more and more sections of the workforce. Once training has reached sufficient proportions then benefits will become measurable and real. To reinforce this IMC have trained TTK counterpart trainers in computer skills to enable them to develop new courses. A Project Monitoring Group was set up to maintain senior level management co-ordination and involvement in the training programme. This group included the Company Directors from all five TTK subsidiary companies, TTK's Deputy Director General and Training Centre Management. Additionally, monthly liaison meetings have been established between the Training Centre and district senior Training Engineers to maintain effective co-ordination of the Training Programme.

An additional computer familiarisation course was held for counterpart TTK trainers to establish sustainability within the training organisation. Each trainer underwent a four day course to learn the procedures and skills necessary to produce training documentation to the same format and standard established by IMC.

All training course manuals have been produced in hard copy format in the Turkish language which include Tutor Notes, slides, Test sheets, Questionnaires, Theoretical and Practical Assessment Sheets and Course Records. All courses have been recorded on Compact Disks with additional copies for security purposes.

7.1 Training Continuation

IMC have sharpened and strengthened the ability of TTK trainers to continue with the existing courses and to develop new course curriculum. It remains for TTK to exploit the new skills of their trainers and to institutionalise the training framework as laid down during the training consultancy period. It is strongly emphasised that TTK should maintain the Monitoring Group and continue to implement the course. Each element of the training activities should continue to be regularly assessed and trainees monitored on their return to their workplace for improvements in performance, safety and equipment efficiency.

7.2 Localised Training resources

Amasra and Armutçuk mines were formerly part of Uzulmez and Kozlu districts respectively and their training requirements were managed by those districts as well as the Training Centre. Since December 1997 however, Amasra and Armutçuk have become independent mining companies and whilst training assistance is still available to the new companies there is a need for them to establish their own training resources on site.

8.0 CONCLUSIONS

To conclude, the Training Project has achieved its objectives within the time schedule laid down in the contract. These are;

- 42 engineers have been trained in Training Techniques and of these 36 have ran courses to the same standards established by IMC
- 14 vocational courses have been designed and delivered covering the specified subjects
- More than 1100 trainees and management have received instruction in the specified vocational courses
- Four Technical Seminars have been delivered to 99 TTK middle managers

- Four Management Seminars have been delivered to 75 TTK senior and middle managers
- The Training Gallery has been refurbished and modernised to European training standards
- Improved liaison control procedures have been established between the Training Centre and mines
- Counterpart Trainers have received instruction in the use of computer technology enabling them to develop additional training courses

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