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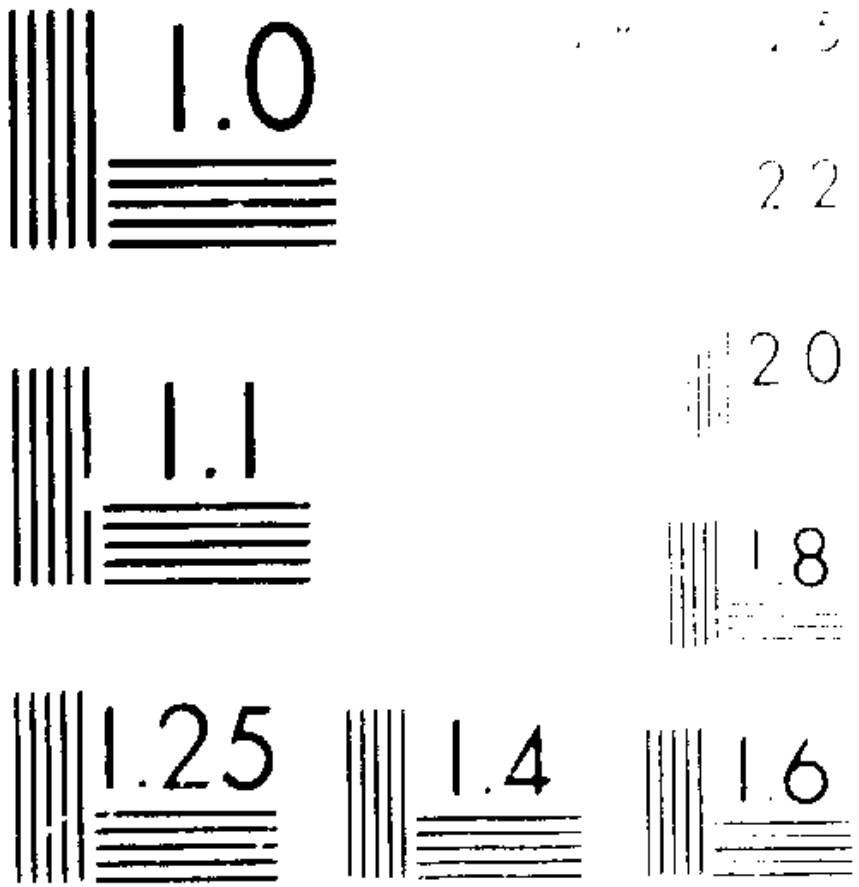
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org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Libya Cement Industry.

TECHNICAL AND ADVISORY ASSISTANCE TO THE SECRETARIAT OF HEAVY INDUSTRIES

TF/LIB/80/001

LIBYAN ARAB JAMAHIRIYA

Mission report

Prepared for the authorities of the Libyan Arab Jamahiriya
by the United Nations Industrial Development Organization

Based on the work of A.M. Afify, technical adviser to the cement industry

V.82-34593

Explanatory notes

References to dollars ($) are to United States dollars, unless otherwise stated.

The monetary unit in the Libyan Arab Jamahiriya is the Libyan dinar (LD). During the period covered by the report, the value of the Libyan dinar in relation to the United States dollar was $US 1 = LD 0.296.

References to "tons" (t) are to metric tons.

The following forms have been used in tables:

A dash (-) indicates that the amount is nil or negligible.
A blank indicates that the item is not applicable.

Totals may not add precisely because of rounding.

The following abbreviations of organizations are used in this report:

DEMAG	Mannesmann Demag Baumaschinen, Federal Republic of Germany
FCB	Fives-Cail Babcock, France
HMC	Holderbank Management and Consultancy, Switzerland
KHD	Kloeckner Humboldt Deutz, Federal Republic of Germany
LCC	Libyan Cement Company, Benghazi
MHI	Mitsubishi Heavy Industries, Japan
PEG	Prospective Engineering Gestion, Switzerland
SHI	Secretariat of Heavy Industries, Tripoli

Mention of firm names and commercial products does not imply the endorsement of the United Nations Industrial Development Organization (UNIDO).

ABSTRACT

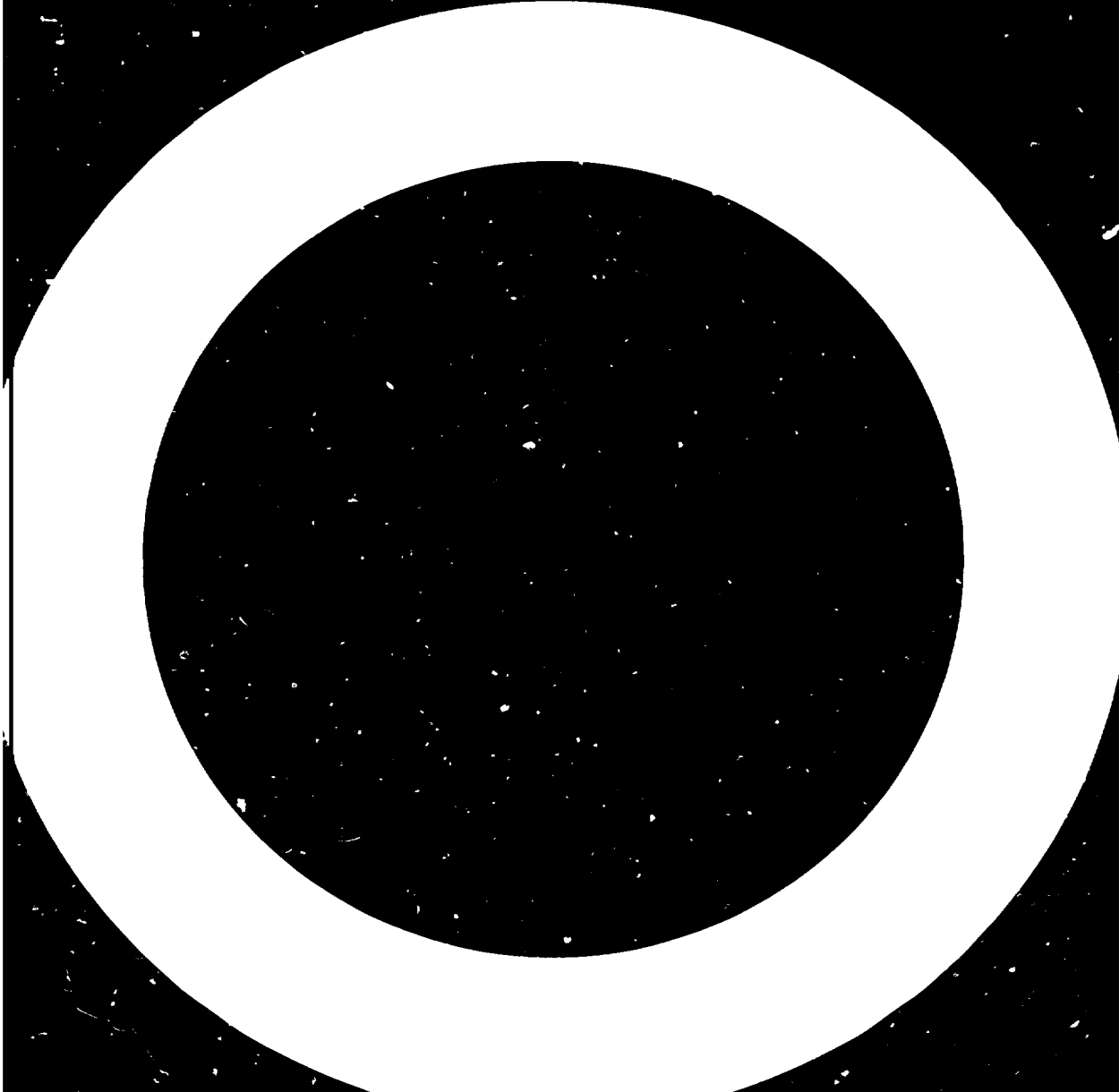
This report describes the activities of the mission, "Technical and advisory assistance to the Secretariat of Heavy Industries" (TF/LIB/80/001), under which the expert was assigned by the United Nations Industrial Development Organization (UNIDO) to the Secretariat of Heavy Industries in the Libyan Arab Jamahiriya as technical adviser on the development of the cement industry. The mission lasted from December 1981 to October 1982. A report on the expert's earlier one-month exploratory mission has been issued separately (UNIDO/IO/R.14) and contains further background information on the issues dealt with here.

The expert has been advising on the general development of the Libyan cement industry, the day-to-day problems of cement plants in production and those still in the construction or planning stage, the problems of an adequate supply of trained personnel and the rational use, storage and distribution of cement within the country.

Specific examples of these activities are described in connection with visits to the Al-Khums I and Al-Khums II cement plants, to the Libyan Cement Company in Benghazi, the Souk-El-Khemis cement plant, the Zliten cement project and the El Fatayeh cement plant.

The expert was especially involved in finalizing the technical-co-operation agreement with UNIDO for the provision of a technical-assistance team to help operate the El Fatayeh cement plant at Derna and in interviewing and selecting candidates for this team.

The expert also took part in organizing the Interregional Cement Technology Forum which was held in Benghazi from 13-20 April 1982 under the joint auspices of UNIDO and the Secretariat of Heavy Industries.



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INTRODUCTION

This report describes the activities of the mission, "Technical and advisory assistance to the Secretariat of Heavy Industries" (TF/LIB/80/001), under which the expert was assigned to the Secretariat of Heavy Industries in the Libyan Arab Jamahiriya as technical adviser on the development of the cement industry. The mission lasted from December 1981 to October 1982 and the adviser was based in Tripoli. This mission was preceeded by a one-month exploratory mission (from 20 October to 20 November 1981) which was financed under the project, TF/LIB/75/002, as the longer-term assignment had not at that time been finalized. The report on the exploratory mission has been issued separately (UNIDO/IO/R.14) and contains further background information on the issues dealt with here.

The cement industry in the Libyan Arab Jamahiriya has been constantly expanding. The National Company for Cement and Building Materials (Al-Khums I) was the first to start cement production at the beginning of 1969 with a production line of 100,000 tons per annum capacity. The second production line was started up in January 1976 with a production capacity of 340,000 t/a.

The Libyan Cement Company followed in Benghazi where the first production line was started up in April 1972, followed by the second production line in January 1974 and the third production line in January 1977 bringing its total production capacity up to 1 million t/a. In September 1978, the Hawari Cement Plant was started up with a production capacity of 1 million t/a.

The Souk-El-Khemis General Company for Cement and Building Materials started cement production in June 1977 with an installed capacity of 1 million t/a.

The Libda Cement Works (Al-Khums II) was provisionally taken over in March 1981 with a production line of 1 million t/a.

The Libyan cement industry therefore has a present installed capacity of 4,440,000 t/a and includes a complex of building-material industries.

Two cement works are under construction, the El-Fatayeh Cement Project in Derna (expected provisional take-over by the end of 1982), and the Zliten Cement Project (anticipated finishing date, July 1983). Each of these two projects has a production capacity of 1 million t/a.

The Southern Cement Project is being designed with 1 million t/a capacity to be installed in Al-Jufrah. The total production capacity would then amount to 7.44 million t/a by the year 1990.

It is hoped that, by the year 2000, a new cement works of 1 million t/a capacity will be installed in the western region and that an additional 2 million t/a cement will be available as surplus for export. The feasibility of realizing these hopes is under study.

This rapid expansion of the cement industry has led to an increasing need for technical assistance and the UNIDO technical-assistance project has been operating in the field since 1976. The present expert was assigned to the Secretariat of Heavy Industries in Tripoli to advise on the general development of the cement industry. Specifically, the expert was expected to:

(a) Participate in national planning of the cement industry and give advice whenever requested on matters within his competence in the cement industry;

(b) Participate in studies on the cement industry dealing with the problems of existing plants, plants under construction and the feasibility of new projects;

(c) Advise on industrial and technical research and follow up the application of the results;

(d) Participate in planning and preparation of reports and statistics showing general trends in the cement industry and the possibility of utilizing international experience and research;

(e) Hold discussions with technical experts and evaluate their work;

(f) Take part in discussions with contractors to help ensure that local conditions are taken into account in the supply of technology;

(g) Follow up new projects, their timing and technical progress, participate in acceptance tests and identify shortcomings during the take-over procedures;

(h) Give co-operative support to national personnel involved in project activities and training in the performance of their technical duties;

(i) Participate in interviewing and selecting technical-assistance teams to be assigned to industrial projects and seeing that they are acquainted with their duties.

The national counterpart during the mission was Mohammed El-Taher, in charge of affairs relating to cement in the Department of Engineering and Projects (Secretariat of Heavy Industries) and secretary of the committee for the Southern Region Cement Project. The counterpart has been directly involved in the questions discussed here, and will continue to follow them up in the future. The expert's findings and recommendations for actions to be taken have already been submitted in Arabic to the Secretariat of Heavy Industries and to the personnel in organization directly concerned.

RECOMMENDATIONS

1. A review should be made of the present progress and structure of the cement industry and its future prospects so that planning can be geared to the realities of the situation. The study could be monitored by the Industrial Research Centre where the data bases are available and evaluation analysis is possible.

2. The present wastefulness in the use of cement should be reduced by mixing the concrete components in the proportions appropriate to each type of application. The concrete components, especially cement, should be handled and stored with great care, being chemical compounds to be kept as pure as possible. The cement setting time should be carefully considered and appropriate amounts should be exactly mixed. Two concrete-batching plants are planned in Tripoli and Benghazi for the production of ready-made concrete so that concrete can be scientifically prepared and properly issued to the building sites. These plans should go ahead as soon as possible.

3. Ready-mixed cements should be produced for masonry, plastering and flooring work. The production of mixed cements should be preceeded by a study of the available raw materials and work on the introduction of their use into national standard specifications and codes of practice.

4. Appropriate storage facilities should be made available for consumers so that cement in proper condition is available at all times, whatever irregularities may occur in distribution arrangements and transport facilities.

5. The cement sales price should be reconsidered so as to give a reasonable profitability to cement producing units to ease their financial situation and make possible better maintenance and operation facilities.

6. Transport facilities to various parts of the country should be co-ordinated so as to ensure a regular supply of cement.

7. The dispatch of cement in bulk should be encouraged by providing facilities for it such as bulk trucks and silos for reception and storage, with special facilities for withdrawal and weighing. This would be more economical, would free distribution from the fluctuations in imported paper sacks and would save trouble wasted in packing and unpacking bagged cement.

8. The idea of the transfer of production line 1 in the Al-Khums I cement plant to Wadi Ash Shati should be given up. This production line is scheduled for incorporation in the renovation and modification of production line II so that the capacity of the latter can be raised from 1,000 to 1,300 tons of clinker per day, which is equivalent to the total production of the two lines together. It would be better to plan for completely new production facilities of modern design in Wadi Ash Shati.

9. It is highly recommended that well-prepared preventive maintenance systems should be adopted in all cement plants so as to preserve the machinery and rationalize production. Appropriate preventive maintenance systems must be preceeded by a considerable period of recording maintenance and repair information. This should be started immediately as the preparatory stage for the introduction of proper preventive maintenance.

10. In the Libyan Cement Company in Benghazi, new gypsum deposits should be exploited to provide an adequate supply of gypsum and the limited resources of the present gypsum quarry should be used only in emergencies.

11. The ordering of spare parts for cement and building-material plants should be so organized that ordering is automatic when stocks reach a certain level. They should never fall below this minimum so that spare parts are always available when needed.

12. In the Souk-El-Khemis Cement Plant, it is highly recommended that a limestone quarry should be opened in the area E1 and its product mixed with the limestone from the quarry area D. This would reduce the high alkali content of the limestone from area D and lessen the magnesium oxide (MgO) contamination in the limestone from area E1. The cost of opening a quarry in area E1 now would be less than the cost of doing so as scheduled in 1984.

FINDINGS AND CONCLUSIONS

A. Activities

During the mission, the expert has been dealing with questions relating to building materials in general and the cement industry in particular. Special efforts were made towards maintaining current production targets in operational factories and reviewing the progress of projects under construction. Care has been given to following up current studies and relating their results to previous investigations. A considerable part of the time was spent on day-to-day production problems and in assisting national technical personnel to solve the industrial and technical problems which confront them.

In addition to normal day-to-day problems, the expert gave particular care to specific long-lasting questions such as:

(a) Assessing the labour situation in relation to present requirements. New regulations have been issued on the organization of personnel, standards of recruitment and promotion principles. The expert assisted in developing new organigrams in accordance with the new regulations and the Secretariat has taken steps to put these into effect;

(b) Checking on the progress and development of the El-Fatayeh Cement Project in Derna. The previous work of the expert on this project during the stage of preparation of technical specifications has been a useful basis for advising on subsequent questions;

(c) Co-operation with the committee for the Southern Cement Project during the stage of preparation of tender documents. This was an extension of the activities of A.R. Marei, project co-ordinator of the UNIDO technical-assistance project in Benghazi, who has been rather busy with the day-to-day problems of the technical-assistance team and could only occasionally visit Tripoli;

(d) Giving technical advice on occasional questions arising in the cement field.

The following sections give case studies of specific questions tackled by the expert during the mission period.

B. National cement production during 1981

Difficulties that have prevented full operation

Figures for the production of building materials in the Libyan Arab Jamahiriya are shown in annex I. The figures for cement production during the year 1981 are summarized in table 1.

Table 1. Summary of cement production figures for 1981

Cement plant	Installed capacity (thousand tons per annum)	Production target (thousand tons)	Production target (% of capacity)	Actual production (tons)	Actual production (% of target
LCC: Hawari and Benghazi	2 000	1 500	75	1 358 391	90.6
Al-Khums I	240	180	75	175 857	97.7
Souk-El-Khemis	1 000	750	75	707 992	94.4
Al-Khums II	1 000	700	70	480 710	68.7
Total	4 240	3 130		2 722 950	87.0

There has been a vast increase in local cement production. Total production rose from 1,900,992 tons in 1980 to 2,782,950 tons in 1981, an increase of 43.2%. However, the demand for cement also increased to such an extent that local cement production has not been able to keep pace with it. The increase in cement consumption has been affected by the following factors:

(a) The current five-year development plan includes large and complex projects with huge cement requirements;

(b) Additional projects and facilities have been introduced involving building and construction work and creating unforeseen demands for cement;

(c) Wastage of the available cement occurs due to the exaggerated safety factor in concrete design, excessive cement addition and faulty cement storage.

Because of these factors, the average per-capita cement consumption was 1,100 kilogrammes per year which is extremely high in comparison with world figures or those of developing countries. Total consumption of cement amounted to 3.1 million tons, of which 2.7 million tons was locally produced and 0.4 million tons was imported.

However, local cement production could have met the whole of local demand. In 1981, the cement industry realized 87% of its scheduled target. If the scheduled production had been achieved, it would have been sufficient to meet all local demands. Various difficulties have prevented the full operation of the plants, among them the following:

(a) Shortage of raw materials and other supplies. For example, the delayed delivery of bauxite and of paper bags to Al-Khums I cement works. The bauxite was replaced by local clay. To deal with the shortage of paper bags, studies are being carried out on the use of polyethylene bags from the petrochemical industry;

(b) Lack of spare parts when there is an unforeseen failure has led to unexpected stoppages;

(c) Fuel-oil shortages as a result of irregular deliveries from the suppliers. These have been contacted with a view to assuring a regular supply in the future;

(d) Irregular power supply. Stoppages have been caused by the failure of the electrical current. Drops in voltage also cause irregularities in the kiln operation leading to serious damage to the refractory lining. The solution will be sought in co-operation with the Secretariat of Electricity;

(e) Lack of water. In some cases the water supply is less than the minimum required for the necessary cooling of bearings and control equipment. The possibility of drilling additional wells and extending pipelines is being investigated. The industrial use of water may be modified in accordance with modern trends in this field;

(f) Deficiency of manpower. Trained national personnel are continuously leaving the cement works, either to go to other positions or to enter military service. Foreign manpower is being sought as substitutes and continuous efforts are being made to develop the skills of local technicians;

(g) Marketing problems. Production was stopped as a result of cement accumulation in the cement silos. This occurred because a considerable number of transport lorries were withdrawn for other uses and distribution was therefore interrupted. The expense and difficulty of transport by trucks is one of the main problems in cement distribution;

(h) Various other factors such as the irregularity of raw-material supplies, partial setting of the cement in storage silos, cracks in mill shells, lack of drainage canals and pumping devices. Each problem is being tackled to find the appropriate solution.

If these difficulties can be overcome and production targets met in the existing cement plants, and taking into account the increase in production capacity represented by the cement works now under construction or in the planning stage, it ought to be possible for the Libyan cement industry to become self-sufficient and even to produce a reasonable surplus for export.

Table 2 shows the development of the cement situation from 1969 onwards. Planning in this sector started to show positive effects with the three-year development plan, 1973-1975, and continuing progress during the next five-year development plan, 1976-1980. It is hoped to achieve fully the targets of the present plan, 1981-1985, by which the production capacity would be raised to 6,440,000 tons per year and imports reduced to a minimum.

The figures also indicate that production efficiency declined from 73% to 37% over the five years, 1974-1978, and that an evident improvement has taken place from 46% to 61% in the last three years, 1979-1981.

Recommendations for improving the cement situation

Rationalization of cement application. The design work should provide for technical requirements, adopting a reasonable safety factor. The proportioning of concrete components should be calculated and followed with utmost care to avoid wasting cement. Cement quality should be kept to appropriate standards through proper storage. The best procedure would be the

Table 2. Development of operational capacity and imports of cement, 1969 onwards

Year	Installed capacity ('000 tons)	Actual production ('000 tons)	Cement imports ('000 tons)	Cement consumption ('000 tons)	Operational efficiency (%)	Ratio of imports to consumption (%)
1969	100	64	598	662	64	89.0
1970	100	95	405	500	95	81.0
1971	100	76	583	659	76	88.5
1972	300	179	1 354	1 533	60	88.3
1973	300	259	1 803	2 062	86	87.4
1974	700	513	1 727	2 240	73	77.1
1975	1 040	615	2 591	3 206	59	80.8
1976	1 440	670	2 032	2 702	47	75.2
1977	2 440	907	1 598	2 505	37	63.8
1978	3 440	1 281	983	2 264	37	43.4
1979	3 440	1 587	1 044	2 631	46	39.7
1980	3 440	1 901	318	2 219	55	14.3
1981	4 440	2 723	400	3 123	61	12.8
1985[a/]	6 440	4 830	115	4 945	75	2.3
1990[a/]	7 440	5 982	-	5 952	80	-
2000[a/]	10 440	8 352	(-518)[b/]	7 834	80	-

a/ Forecasts from the Secretariat of Planning.

b/ The minus imports represent exports.

installation of concrete-batching plants for selling ready-made concrete in which the concrete components would be properly treated to avoid deterioration in quality, correct storage would eliminate many errors and delivery would be adjusted to requirements without any waste.

Production of special cements. It would be economic to produce mixed cements suitable for various applications in normal masonary, plastering, flooring, and similar uses which would not require especially high strength.

Construction of proper stores. Cement should be available to consumers at all times and comply with standard specifications. This could be achieved by proper storage facilities which would maintain standards of cement quality even if there are transport and distribution difficulties.

Fixing cement prices. Prices should be fixed in different distribution centres, taking into consideration the industrial cost price and allowing a sufficient profit according to the economic situation of the production units, in order to provide suitable incentives for building up the cement industry.

Co-ordination of cement distribution. This could be achieved by an independant body to plan cement marketing and distribution and solve problems arising in this area. This body should be directed by a committee drawn from the management of all the cement works.

Improvement of transport. This is necessary to promote efficient distribution to consumption centres and to balance the sales price so that cement is available at the right time and the right price.

Promotion of bulk cement dispatch. At present, cement deliveries are divided into bagged and bulk dispatch to individuals, national and foreign firms in the following proportions:

	(Percentage)		
Consumer	Bagged cement	Bulk cement	Total
Individuals	99.8	0.2	26.9
National firms	26.8	73.2	34.1
Foreign firms	5.0	95.0	39.0
Total	37.9	62.1	100.0

It is highly recommended that bulk cement dispatch should be encouraged as bagged cement has the disadvantage of involving greater expense and labour in packing and distribution.

C. Al-Khums I Cement Plant

On 18 February 1982, a visit was arranged to the Al-Khums I Cement Plant together with two experts from Holderbank Management and Consultancy (HMC). In addition to the works inspection, a meeting was held with M. Freig (Works Manager), A. Zeidan (Production Manager) and O. Magdalawi (Cost Accounts Department), at which the following questions were discussed:

(a) The proposal to transfer the first production line at Al-Khums I to Wadi Ash Shati to form the nucleus of a new cement plant there;

(b) How to improve the second production line at Al-Khums I.

On the first question, the proposal has not been backed by a feasibility study. In principle, the transfer would be uneconomical due to the high costs anticipated for transport, civil work, and supplementary equipment. The operation of a production line of that size in Wadi Ash Shati is also likely to be uneconomical. It would be better to design the new project at Wadi Ash Shati with modern, cost-saving installations.

As for the second production line, one effective solution would be to carry out a comprehensive programme of repairs using a team of well-qualified engineering experts. Certain necessary preparations would have first to be made, including the following:

(a) A precise study of the problem and appropriate solutions;

(b) Calculation of the considerable investment necessary for engineering modifications and the introduction of additional equipment, especially that for dedusting various parts of the process;

(c) Introduction of a comprehensive programme for preventive maintenance which has to be strictly followed so that machinery and equipment are kept in good running order.

It was thought that the profitability of the repaired production line would be improved if it concentrated mostly on the production of special cements (such as rapid-hardening cement) and ready-mixed cements.

D. Al-Khums II Cement Plant

The expert visited the factory site at Libda (Leptis Magna) on 16 January 1982 in the company of M. Yazid (Director General of the production department in the Secretariat of Heavy Industries) and H. Abd-El-Aal (production engineer). Various matters were clarified.

Electrostatic precipitators. It has been discovered that stoppages are due to the following causes:

(a) Operational difficulties such as those caused by irregularities in feed flow. At the beginning and the end of the visit, the electrostatic dust precipitators were operating efficiently. In between, there occurred an unbalance in kiln operation caused by excessive raw-mix feed. This was attributed to a sudden change in the fineness and moisture of the raw mix which was beyond the control of the weigh-feeder. The uneven burning caused a build up of carbon monoxide gas and the response of the explosion-preventing device disconnected the electrostatic precipitators so that huge amounts of dust were released with the flue gases;

(b) Frequent blockages of the gas-sampling device which is one of the defects which the general contractor is supposed to be eliminating;

(c) Problems of water supply to the conditioning tower due to defects in the water pumps. It is understood that these are being tackled by the general contractor during the guarantee year.

Failure of power supply. M. Yazid studied the situation and discussed the matter with the technical engineers responsible. It was emphasized that most of the cases of power failure were attributable to reductions in voltage and fluctuations in current from the mains power supply. None of the cases was found to originate in the works. This answers the dispute about the cause of current failure. Evidence for the facts given can be derived from the recorders located in the control centre. The Secretariat of Electricity has provided control shifts for about one month to record any incidents which arise and to carry out required rectifications. No failures in the power supply have occurred since then.

M. Yazid acquired a copy of drawings which show the main electrical connections and positioning of recording facilities for discussion with representatives of the Secretariat of Electricity when necessary.

Change in personnel distribution. The composition of the technical-management team was reviewed. It was discovered that in practice the composition of the team deviates somewhat from that mentioned in the original agreement. The changes had been made in response to work requirements, i.e. an increase in cement dispatch which necessitated operation of the packing plant with an additional shift. However, the total number still does not exceed 243 persons and the half-yearly payment is not higher than the contractual 554,000 Libyan dinars. This complies with the stipulations of the technical-management contract.

Problem of the nose ring. The factory was visited again on 8 June 1982 to study the question of the breakage of the enclosure guiding the cooling air for the nose ring of the rotary kiln. The question was discussed with the Secretary of the People's Committee, the mechanical engineer of the technical-assistance team from the suppliers, Fives-Cail Babcock (FCB), the mechanical and production engineer from the technical-management [illegible] of the Indian consultants, Development Consultant International Limited, and members of the cement works' management. All expressed their views on the cause of the incident and the remedial measures proposed for it. The case was further studied by direct inspection of the plant and of engineering drawings and the following conclusions were reached:

(a) The problem started with the breakage of the supports of the double frame guarding the cooling air for the kiln outlet, at which point the kiln was stopped immediately for repairs;

(b) The logical explanation of this incident was the formation of an irregular coating, leading to an uneven temperature distribution, followed by abnormal fatigue of the fittings in the region of excessive heat conduction. The supporting S-springs consequently lost their elasticity and one of them was broken. The breakage was then transferred to the neighbouring supports by the kiln's rotary movement. It is quite probable that the breakage was initiated by a temporary oval-shell deformation caused by the uneven distribution of clinker coating.

The mechanical engineer from the technical-assistance group introduced a modification to avoid repetition of the breakage in the future. The S-springs were replaced by straight supports. The expected expansion was dealt with by inserting bolts of 24 millimetres' diameter in 36 millimetre holes, thus leaving a clearance of 12 millimetres at each hole. This would allow for the maximum anticipated expansion. A strip of sheet-iron 30 millimetres wide was cut off along the whole circumference from the inner side to avoid direct expansion consequences. FCB were consulted and gave their approval on the technical aspects of this substitution. Periodical inspections will be made to check on the success of this modification.

E. The Libyan Cenent Company, Benghazi

On 20 January 1982, the expert visited the works site, accompanying M. Yazid, General Manager for production, and S. Mailud from the Secretariat of Heavy Industries, who is responsible for industrial safety matters. The following issues were discussed.

Production data. The volume and timing of production information to be supplied to the Secretariat to enable proper control to be exercised was discussed. The form for daily production figures was revised. It was agreed that production figures should be telexed to the Secretariat so that they can maintain continuous supervision. The stock records should be corrected monthly according to the actual stocks as checked by the special committee.

Industrial safety. The findings of the survey carried out by the UNIDO expert, J. Singh, were reviewed. He has already submitted his comments to the appropriate committee.

Electrostatic precipitators. A book-keeping credit has been opened for the visit of an expert from the Swiss firm, "Elex". It was emphasized that this expert will investigate all makes of electrostatic precipitators in all the cement works in the Jamahiriya and will submit his proposals for dust removal.

Operational difficulties. It was concluded that the most important obstacles are lack of technical skills and spare parts, and difficulties in the issue of import licences.

Technical-assistance team. This is proceeding well. The standby list of personnel was about to be exhausted. An interview session was being arranged in Poland, though delays had occurred due to the declaration of martial law.

Gypsum quarrying. A new gypsum supply is anticipated from the Sidi Al Mabruk area, three kilometres north of Hawa Al Baraq, with about 3.5 million tons of reserves. As a farm at present stands on this ground, efforts are being made through the Secretary of Light Industries in Al-Marj to make exploitation of the gypsum possible.

F. Souk-El-Khemis Cement Plant

Main bottlenecks

A committee from the Industrial Research Centre carried out a detailed study of the technical, financial, and administrative aspects of the Souk-El-Khemis General Company for Cement and Building Materials. The study has disclosed the main bottlenecks.

Maintenance. Proper programming is required so as to achieve an adequate preventive effect and avoid unexpected stoppages.

Water. Shortage of water leads to serious industrial problems. It is understood that a consultant is being employed to make a closer study of the problem and to develop technical specifications for drillings and for pipelines to carry the water to the site from the new wells.

Iron oxide. There are difficulties in transporting the ore from Brak to the site. It is understood that the company could solve the transport problem by having its own trucks to transport the ore from Brak.

Electrical current. The failure of the electrical-current supply and the consequent interruption of kiln operation reduces the life of the firebricks as well as causing a loss of production.

Manpower. The company suffers an acute shortage of skilled specialists. This calls for a comprehensive training programme.

Spare parts. An unforeseen shortage of spares would hamper the maintenance programme. This necessitates the introduction of a well-defined system for automatic ordering when a certain stock level is reached.

Financial system. It is understood that a study made by Gar Yunis University has emphasized the need for a rationalized financial system with proper documentation and cost-accounting checks.

Quality control. In compressive-strength tests, standard sand should be used.

The expert was asked to comment on the study. Its main recommendations can be summarized as follows:

(a) Implementation of a comprehensive programme for training national personnel with special stress on on-the-job training;

(b) Development of a close co-operation with other cement works to exchange information and compare experience;

(c) Holding of regular meetings to check progress and to decide on corrective measures where necessary;

(d) Continuous review and analysis of cost accounts to achieve the most economic running;

(e) The use of clay in order to reduce the iron oxide required in the raw mix;

(f) Preparation of standard testing sand from local desert areas. Great care must be taken with quality control procedures;

(g) Ensuring spare-part requirements through planning a regular supply according to a proper time schedule;

(h) Planning a preventive-maintenance programme, rationalizing supervision and streamlining the procurement of parts for maintenance.

Alkali in the limestone

The Souk-El-Khemis works at present procures its limestone from area D of the limestone quarry. This limestone has a comparatively high alkali content of 2%. Several visits were paid to the Souk-El-Khemis works during the period 13 July to 14 August 1982 to study the results of the chemical analyses and the geological investigations previously carried out by the Polish firm, Polservice, to inspect the actual quarrying process and to have discussions with the technical staff about the results of the investigations. The results of the study are described in the following paragraphs.

High alkali percentages in cement would lead to destructive expansion and the strength-resistance would therefore diminish when the cement is used in alkali-reactive aggregates. The danger of this is serious as faults only start to show several years after the concrete has been cast. The period depends upon the alkali percentage in the cement, the nature of the aggregate used and the degree of humidity needed to bring about the reaction. The civil contractor will by then have left the site and the concrete will be under full stress which could aggravate the damage.

Several accidents have occurred throughout the world, in connection with which the effect of alkali ingredients has been considered, but adequate information on this aspect is not yet available and related research work is still in an early stage. Owing to the comparative novelty of this phenomenon, the lack of precise information and the long period necessary to establish definite effects, the standard specifications have not provided any stipulations for alkali-aggregate reaction. It is left to local codes of practice to impose the use of low-alkali cements, i.e. those with less than 0.6% alkali calculated as sodium and potassium oxides.

Although the concrete used in the Libyan Arab Jamahiriya has not yet shown any signs of alkali-aggregate reaction, prudence suggests the need for confirmatory investigations on available aggregates in international research institutes. As the country nears the stage of exporting cement, it will be necessary to ensure that alkali ingredients are kept below the safe limit.

Limestone is at present extracted only from the quarry area D, which was estimated by Polservice to contain confirmed reserves of 14.3 million tons of limestone. In the quarry area E, the confirmed reserves were calculated as 36.9 million tons, giving a total of 51.2 million tons. This would last for about 38 years of production at the plant's rated capacity. This calculation is based on production of one million tons of normal Portland cement per year, with a conversion factor of 1.6 and a limestone proportion of 85% in the raw mix. The geological research work contained a proposal in which the first

quarry front in the area E was scheduled to be opened in 1985. The Industrial Research Centre revised these studies, eliminated some peripheral areas, thus reducing the proven reserves to a total of 35.5 million tons, and proposed an ammended schedule aiming at a quarry opening for the first front in area E by the year 1984.

In revising the basic report of the geological investigations and studying the related chemical analyses, it has become apparent that a high alkali content of up to 10% may exist in some locations, especially in the southern area, due to the presence of basaltic sills. This would require special care in separating out the basaltic ingredients during the quarrying process. The limestone from area D is generally low in magnesium-oxide (MgO) content so that its use is safe in this respect. The report also concludes that limestone from area E is generally low in alkali content, which reduces the risk in this connection, but that the presence of MgO generally endangers the quarrying process. Recommendations were made for admixture so as to reduce the MgO ingredients to acceptable limits. This risk applies particularly to area EI, where the MgO content is undesirably high in some spots, and this would require special mixing skills.

The geological studies indicate that the area EI is covered by about 355,000 cubic metres of limestone. There are two limestone layers at approximately 320 and 355 metres above sea level. A study of the chemical composition of the limestone at these levels shows that alkalis are reasonably low in all samples but that the MgO percentage varies considerably. Full details are shown in annex II.

It is proposed to start opening quarries in the area EI earlier than scheduled in order to mix its limestone with the output of the present area D. The high alkali content from the present area will thus be reduced when mixed with low-alkali limestone from EI. The danger from the high MgO content in area EI will also be reduced through its dilution with low-MgO limestone from area D. The constituents of the limestone in the rest of area E will be regulated by on-the-spot mixing.

The investment required for opening the quarry area EI is reasonable in comparison with the cost of exploitation of the whole area E. The economic evaluation indicates that early exploitation would involve less investment than the scheduled later opening on account of continuing inflation. The economics of the situation could be improved by using the dolomitic overburden from area EI, which is estimated to be about 863,000 tons. The possibility should be studied of its being ground with clinker in the final grinding process to produce mixed cement which can be used in normal plastering and building work and in other applications which do not necessarily require excessive strength. The use of normal Portland cement in these cases is unnecessary and wasteful. The production of the new type of cement requires a series of studies. The Standard Specifications and the code of practice should be taken into consideration.

During the transitional phase until the limestone from area EI is available for mixing with that from area D, extreme care should be taken to separate out basaltic rocks during quarrying from different levels according to the chemical composition of the limestone from each level.

G. Zliten Cement Project

This plant, which is now under construction, was visited by the expert in the company of the Under-secretary of Heavy Industries on 27 December 1981.

Site inspection and discussions with representatives of the general contractor, Kawasaki, established that the machinery and equipment at the site amounted to 1,300 tons, representing 6.8% of the total calculated installation of about 19,000 tons. It was stated by the Kawasaki site manager that about 14% of the equipment had arrived at Libyan harbours and was awaiting customs clearance and transport to the site.

The construction work had only achieved 15% of its planned programme and was two months behind schedule. The site manager affirmed that the programme has been revised so as to catch up with the original schedule by accelerating the erection work which has already started with the kiln preheater tower. He also gave assurances that the work was proceeding well with about 550 technicians at the site.

After studying the situation on the spot, the secretary of the people's committee was advised to pay special attention to the following:

(a) Drilling more water wells to ensure an adequate water supply of the appropriate quality for the planned water-treatment facilities. Studies suggest the use of demineralized water from the Al-Khums power station;

(b) Proper planning and co-ordination of the electricity supply to fit in with the contractor's electrical installations. Specifications and the connection schedule should be quite clear;

(c) Revision of the technical and economic studies for the road and bridge connecting the factory site to the main coastal road. The revision should consider the possibility of a road passing through Wadi-Kieaan to avoid the expense involved in the present design and to make use of the existing bridge;

(d) Proper manpower planning with comprehensive programmes for training during the stages preceeding the start-up so as to give a proper technical foundation to the national staff;

(e) Preparation of technical specifications for quarry equipment, making use of those prepared for the El-Fatayeh Cement Project;

(f) Taking special care in the opening of the limestone quarry.

H. El-Fatayeh Cement Project

Meeting of 21-22 January 1982

The project site at Derna was visited on 21-22 January 1982 by the expert in the company of A.M. El-Gheriani, M. Yazid, S. Mailud, and S. Shaker. A site inspection was made to check on the progress of the project. Discussions were held with A.R. El-Ghazali, G. El-Shilwi, K. Elissa and the consultant's representatives, and a meeting was held between the aforementioned and the contractor's delegates.

The following were among the issues discussed.

Gypsum requirements. It was understood that an arrangement had been made with the Libyan Cement Company, Benghazi, to supply gypsum for the preliminary stages including the start-up and acceptance tests leading to the provisional taking over. An offer had been obtained for imported gypsum from Cyprus. Meanwhile, technical and economic studies were continuing on the extraction of gypsum from the As-Sidrah deposit. It was agreed to ask the Industrial Research Centre to carry out an investigation of the gypsum in the Sidi Al Mabruk area, three kilometres to the north of Hawa Al Baraq. Preliminary prospecting had indicated the probable existence of about 3.5 million tons of gypsum in this area. The geological study would also be extended to cover the Al Himadah area near Bardiyah, where raw-materials investigations carried out by Polservice had indicated the possible existence of gypsum.

Safety principles. S. Mailud tackled questions relating to industrial and personal safety, defining the preparations to be made during the present phase of construction. These included the installation of protective devices, fire-fighting equipment, the design of watch towers, personal protection, and means of communication either by intercom or wireless systems.

Technical documentation. The consultant stated that the results of the revision of technical documents carried out in Hiroshima, Japan, were generally satisfactory. Some alterations were being made to instruction manuals by the contractor on the advice of the consultant. M. Yazid proposed to record the contents of the documentation on microfilm as the nucleus of a technical archive for future reference.

Electrical connections. M. Yazid accompanied the consultant's electrical engineer on an inspection of the progress of the substation. It was reported that the 220/66 kilovolt (kV) substation will not be ready before the end of June 1982 even at the most optimistic estimate. M. Yazid emphasized the importance of the following:

(a) Speeding up the installation of jumpers for connecting the works to the last electrical tower;

(b) Completing the supplies for the 66 kV side of the substation;

(c) Erection of the 220 kV side including the missing 220 kV towers (two according to information from the Siemens expert);

(d) Studying the possibility of connecting the main works' control station to the Benghazi control centre by imposed frequency to be transmitted through the same line;

(e) Taking necessary measures to insulate the connectors erected over the roof;

(f) Making arrangements to prevent the admittance of unauthorized individuals by issuing work permits (in co-ordination with the Secretariat of Electricity) to persons involved in regular maintenance and inspection;

(g) Arranging for roof drainage as well as the cleaning of roof insulators for the last two towers on the 66 kV line.

Meeting with contractor on 22 January 1982

A meeting was held on 22 January 1982 with delegates of the contractor, Mitsubishi Heavy Industries (MHI). T. Ishigai, Deputy General Director of MHI, clarified the situation. He explained that Mitsubishi had planned to compensate for delays in the civil work by accelerating the construction work so as to maintain the schedule submitted by the contractor during the fourth General Co-ordination Meeting held in Hiroshima, Japan, from 24-30 November 1981. He stated that the introduction of martial law in Poland on 13 December 1981, the consequent closure of borders and the interruption of telephone and wireless communication with Poland had had a demoralizing effect on Polish personnel at the site and had delayed the arrival of personnel and materials from Poland. As the civil engineering and construction work is carried out by Polish staff, the contractor claimed that the force-majeure clause in the contract was applicable. MHI also submitted some statistical data showing the state of the project at the end of December 1981. It was emphasized that the completed civil work amounted to 57.24% compared to the 62.5% scheduled for that date, the mechanical installation was 34.25% compared to the scheduled 53% and the completed electrical work was 32.45% compared to the scheduled 35%. The measures to be taken to expedite progress were as follows:

(a) Shifting 55 Polish workers from temporary to regular categories;

(b) Bringing 22 Polish workers from other sites;

(c) Transfering 22 workers from civil to construction work, particularly in the areas of welding, mechanical work, and installation of firebricks;

(d) Extension of working hours for 800-900 workers over week-ends against overtime payment in Libyan dinars;

(e) Assembling special task forces for particularly important areas of work such as the raw mill and the preheater tower;

(f) Taking action to get the required labour force from Poland through Polservice offices;

(g) Composing a standby group of 60 Japanese workers to be fielded in case of difficulties in obtaining the Polish labour force.

A.M. El-Gheriani stated that the psychological condition of workers is subject to various factors which can never be attributed to force majeure. Martial law may have prevented the arrival of extra personnel from Poland for some days, but this cannot be considered as a cause of delay as there are more than 1,900 Polish technicians at the site. Their duties can be organized in such a way as to maintain productivity without any need for extra workers. Similar work is carried out with less workers at other sites.
A.M. El-Gheriani commented on the seven-point plan given above as follows:

(i) Items (a), (b) and (c). What effect do these have on the quality of work?

(ii) Item (d). What is the impact upon the next day's activities?

(iii) Item (e). How effective would it be to emphasize one part of the project at the expense of another when the production line is essentially a whole unit? It is necessary to revise the schedule for completion as a whole, giving consideration to all aspects;

(iv) Item (f). It may be less effective to bring in more personnel than to organize those already at the site;

(v) Item (g). The labour-force problem is not new. It had once been planned to employ workers from another country. MHI representatives had mentioned the employment of specialists from the Philippines. If that had been done, the situation could have been much better.

The final conclusion was that the general contractors should make every possible technical and administrative effort to catch up on the delays so that the start-up could take place at the scheduled time.

Fifth General Co-ordination Meeting

This meeting was held at the project site at Derna in two sessions, the first on Saturday 24 April 1982 and the second on Thursday 29 April 1982. During the meeting, the contractor (MHI) submitted a schedule giving the time for the no-load commissioning of the raw-materials section (crusher and raw-materials storage hall) as from the middle of June 1982.

The following conclusions emerged from the meeting:

(a) MHI has to finalize the electrical substation in accordance with recommendations made by the consultants, who will follow it up, and ultimately the Secretariat of Electricity will perform the final check;

(b) The plant will be commissioned in accordance with article 21.2 of the general contract, which stipulates that the load run will be made only when the plant is ready. "The plant" is defined in the contract as the whole plant;

(c) MHI should prepare a corresponding time schedule taking into consideration the points made in (a) and (b). This time schedule should be submitted for discussion at the next (sixth) General Co-ordination Meeting;

(d) The contractual conditions to be fulfilled are those negotiated on 11 November 1979. Any further discussions on fulfilment of the contract will be postponed until after the readiness-for-acceptance tests;

(e) The proposal submitted by MHI, "Procedure for performance tests", has been discussed and accepted, taking into consideration the consultants' remarks. MHI will submit the corrected copies after the amendments proposed by the consultants have been made.

The contractor submitted a statement showing the progress of the work to date.

Civil work:	Excavation, lighting, roads	66%
	Concrete work	95%
	Steel construction	85%
Mechanical construction (by weight of erected machinery)		80%
Electrical construction work		65%
Labour force at site		2,064 persons
Electrical current requirement (as from 1 June 1982)		2 megawatts

Sixth General Co-ordination Meeting

The meeting was held at the site in Derna on the 6 and 7 July 1982 and was attended by representatives from the Secretariat of Heavy Industries, the El-Fatayeh Cement Project, the general contractor and the consultants. Discussions took place on the following subjects.

Progress of civil work and construction. Steps were discussed to rationalize the progress of the work. Achievement up to the end of June 1982 was: civil work 82.6%, mechanical construction 81.1%, electrical work 74.2%.

Manpower. The contractor described the manpower programme showing that the number of active personnel at the site amounted to 1,735 individuals at the end of June 1982. The schedule for the forthcoming period was discussed.

The time schedule. The schedule for commissioning was submitted. It was made clear that electrical current would be needed by the beginning of August 1982 for the dry run of machinery. The project representatives referred again to article 21.2 of the general contract which stipulates that the load run will be made only after work on all parts of the plant is completed.

Raw materials and necessary equipment. A detailed list with specifications has been drawn up.

Procedure for acceptance tests. The contractor submitted further comments on the proposal discussed during the last meeting. Decision on the new comments was suspended pending their consideration and approval by the consultants.

Second phase of training. This includes local training during the commissioning period. It was agreed to adapt the training programme to the final programme for load tests which is still to be submitted.

Delivery. It was confirmed that delivery specifications for civil work, mechanical and electrical machinery and equipment had been handed to the consultants.

The discussions during the meeting came to the following conclusions:

(a) The contractor's planning has been carefully elaborated, but the following points must be considered;

(i) The monthly progress towards the end of construction can not be faster than in previous months since the finishing work is more time-consuming;

(ii) Manpower cannot be decreased while, at the same time, monthly progress is shown to be increased;

(iii) The extent of certain activities such as repair work, site levelling and final completion has been underestimated;

(iv) The time required for presentation and inspection of each department at its completion has been underestimated;

(b) The clients confirmed their statement made at the fifth meeting about proceding with the start-up and take-over tests according to article 21.2 of the general contract;

(c) The contractor shall therefore submit a new construction timetable in which the schedule for commissioning, take-over tests, the second phase of training and the delivery of raw-materials and equipment shall be adapted to the requirements of this article of the contract;

(d) MHI confirmed that the power supply is required as from 1 August 1982. It is well understood that the power supply is needed for cold runs.

The technical-assistance team

A technical-assistance plan has been developed for the Fatayeh Cement Project. When the plant is nearing the stage of start-up and going into production, skilled personnel with ample experience in the operation and maintenance of cement-making machinery will be needed to operate the plant and to train local personnel. Offers to provide a technical-assistance team were submitted by Polservice of Poland, Polytechna of Czechoslovakia, both through UNIDO, and Hyundai of Korea directly to the project committee. As no offer had been received from the Hungarian company, Tesco, by the expiry of the tender period, it was decided to proceed with the other three tenderers whose representatives were invited to the site at Derna for discussion of working particulars and technical, financial and administrative aspects. Final offers were then to be submitted for providing a technical team of 120 cement specialists composed of 15 engineers, 25 foremen and intermediate personnel, and 80 technicians. After evaluating the final offers, it has been decided to award the contract to Polservice of Poland through UNIDO. Conditions are to be the same as those in force for the assistance team presently operating at the LCC plants, Hawari and Benghazi, under the UNIDO project, TF/LIB/75/002. This is financed through a trust-fund arrangement under a reimbursable loan agreement. It has been agreed to follow the same procedure for recruitment and fielding and to make similar provision for the technical, financial, and administrative aspects as in the Benghazi project. Thirty heavy-machine operators were added to the list, bringing the total for the group required up to 150 specialists.

A technical-assistance agreement was drawn up, the text of which is given in annex III. The first version of the project establishment and budget is shown in annex IV.

It was recommended that the specialists should be fielded before the commissioning and start-up so that they could participate in the performance tests. They would then have had time to become familiar with the specific type of machinery in this plant which is certainly different from that to which they have been accustomed. The commissioning period would be their chance to be introduced to the new technology while the commissioning group from the suppliers is still present to answer all their questions.

The technical-assistance activities were originally scheduled to start by the beginning of August 1982, but the whole matter was postponed due to delays in the progress of construction. The expert was one of the delegation which went to Wroclaw in Poland for the interviews which were held there from 20-25 September 1982. During this time, 279 candidates from the required categories (engineers, foremen and technicians) were interviewed. Of these, 169 specialists were successful according to the fitness percentage rating used at the interviews. In addition, there are 19 mechanical and electrical specialists already working at the site for the Polish firm Polymex Cecop, whom it is proposed to transfer to the technical-assistance team. The Secretary of the Supervisory Committee for the project is supposed to check their capability at the site and also to check with technical personnel in the Libyan Cement Company the work history of the 13 successful candidates who had previously worked on the technical-assistance project in Benghazi.

The committee visited UNIDO headquarters in Vienna on the return journey and agreement was reached on the points below:

(a) The technical-assistance agreement was checked and signed after it had been settled that the main sum should be made payable to UNIDO through a letter of credit from which a sum is to be released every three months corresponding to the number of specialists actually in service at the site;

(b) The number of specialists to be taken on at first in the technical-assistance team would be fixed after a closer study of the interview list, the rest of the successful candidates forming a standby group ready for future replacements;

(c) The total number of specialists required would be 155 after the addition of three quarry-equipment operators and two blasters. It was agreed that the job description of the operators would be the same as for the heavy-equipment operators, whereas a job description for the blasters has to be drawn up;

(d) The technical-assistance team will be fielded as from the beginning of 1983, in groups not exceeding 50 specialists at a time so as to simplify the formalities, transport, and accomodation;

(e) Details were settled for the post of team co-ordinator, which will be financed by UNIDO out of the 13% overheads.

I. Interregional Cement Technology Forum

The forum was held with great success in the Special Training Centre for Cement and Building Materials, Benghazi, from 13-20 April 1982. It was organized jointly by UNIDO and the Secretariat of Heavy Industries, Tripoli.

The forum provided an occasion for explaining recent developments in the technology of cement manufacture and for exchanges of viewpoints and practical experience between consultants, research centres and machinery producers in this field. The forum was attended by 23 participants from 14 developing countries in Africa, Asia and Europe, as well as 69 participants from the Libyan Arab Jamahiriya representing the Secretariats of Heavy Industries, Planning, Housing and Public Utilities; the Research Centre and the Faculty of Engineering of Gar Ynis University; the Industrial Research Centre, the Special Training Centre, the Libyan Cement Company, Souk-El-Khemis General Company for Cement and Building Materials, the National Company for Cement and Building Materials, the Libda Cement Works and the El-Fatayeh Cement Project. Twenty one lectures were given by personnel from UNIDO, the Secretariat of Heavy Industries, Gar Yunis University, the Special Training Centre for Cement and Building Materials, The Libyan Cement Company, consulting firms (Prospective Engineering Gestion, Holderbank Management and Consultancy and Lafarge Conseils et Etudes), the Polish Academy for Building Materials, and cement-equipment suppliers (Kloeckner Humboldt Deutz, Haver and Boecker, Refratechnik, and Mannesmann-Demag).

In addition to lectures, country monographs about the development of the cement industry were presented by participants from Algeria, Angola, Chad, China, Democratic Yemen, India, Islamic Republic of Iran, Mozambique, Philippines, Syrian Arab Republic, Thailand and Turkey. Poland and Uganda were also represented at the forum.

The participants visited various departments of the cement complex of the Libyan Cement Company and examined the facilities of the Special Training Centre for Cement and Building Materials.

Details of participants, lectures and lecturers are given in annex V.

Annex 1

PRODUCTION OF BUILDING MATERIALS IN 1981

Company	Installed production capacity ('000 tons)	Actual production 1980 (tons)	Targetted production 1981		Actual production 1981		
			Amount (tons)	Ratio to capacity (percentage)	Amount (tons)	Compared to 1980 (percentage)	Compared to target (percentage)
Libyan Cement Company (Benghazi and Hawari)							
Cement plants (B & H)	2 000	979 745	1 500 000	75	1 358 391	+38.6	90.6
Lime plants (1 & 2)	75	13 992	63 750	85	36 263	+159	56.8
Ceramic-brick plant	60 ('000 m^3)	6 824 (m^3)	51 000 (m^3)	85	21 388 (m^3)	+213	41.9
Concrete-block plant	100 ('000 pieces)	13 958 ('000 pieces)	60 000 ('000 pieces)	60	34 638 ('000 pieces)	+148	57.7
Paper-bag works	50 000	26 273	35 000	70	34 545	+31.4	99.0
National Company for Cement and Building Materials (Al-Khums I)	('000 tons)	(tons)	(tons)		(tons)		
Cement plant 1	100	stopping production	-	stopping production	-		-
Cement plant 2	240	162 349	180 000	75	175 857	+8.3	97.7
Gypsum works	9	2 980	5 400	60	3 092	+3.8	57.2
Libda Cement Works (Al-Khums II)	1 000	122 151	700 000	70	480 710	+293	68.6
General Company for Cement and Building Materials (Souk-El-Khemis)							
Cement plant	1 000	636 677	750 000	75	707 992	+11.2	94.3
Lime plant	100	59 547	90 000	90	78 653	+32	87.3

Annex II

ANALYSIS OF LIMESTONE STRATA IN SOUK-EL-KHEMIS QUARRY AREA EI

(a) At 335-350 metres above sea level

Level of limestone and chemical components	Borehole number						Average
	EIV	EXIII	EXIV	EXV	EXVI	EXVII	
	(metres above sea level)						
Ground level	367.6	361.0	368.4	365.5	357.8	353.6	
Upper limit of limestone	354.2	350.5	356.0	351.6	348.8	352.1	350.0
Lower limit of limestone	334.1	330.0	331.9	334.0	336.2	334.9	335.0
	(percentage)						
Loss of ignition	40.95	41.86	40.80	41.83	42.92	40.16	41.42
SiO_2	5.14	4.25	5.53	4.28	1.65	8.50	4.89
TiO_2	0.07	0.05	0.04	0.00	0.03	0.02	0.04
Fe_2O_3	0.60	0.44	0.73	0.48	0.60	0.49	0.56
Al_2O_3	1.34	0.57	0.80	0.51	0.40	0.90	0.75
P_2O_5	0.03	0.11	0.02	0.03	0.01	0.10	0.05
CaO	48.92	50.65	49.13	51.33	52.97	47.49	50.08
MnO	0.02	0.07	0.01	0.02	0.01	0.01	0.02
MgO	2.18	1.61	1.34	1.11	1.01	1.71	1.49
SO_3	0.10	0.13	0.35	0.08	0.17	0.06	0.15
Na_2O	0.03	0.07	0.39	0.03	0.30	0.07	0.15
K_2O	0.18	0.19	0.38	0.18	0.12	0.11	0.19
Cl^-	0.004	0.020	0.015	0.008	0.023	0.030	0.017
Total	99.56	100.00	99.52	99.88	100.19	99.62	99.79

(b) At 320-335 metres above sea level

Level of limestone and chemical components	Borehole number						Average
	EIV	EXIII	EXIV	EXV	EXVI	EXVII	
	(metres above sea level)						
Ground level	367.6	361.0	368.4	365.5	357.8	353.6	
Upper limit of limestone	334.1	330.0	331.9	334.0	336.2	334.9	335.0
Lower limit of limestone	323.6	319.6	321.1	323.8	322.0	321.9	320.0
	(percentage)						
Loss of ignition	40.16	40.56	37.70	39.86	40.13	39.31	39.63
SiO_2	5.52	5.60	10.29	6.80	5.93	9.58	7.29
TiO_2	0.10	0.04	0.09	0.00	0.06	0.09	0.06
Fe_2O_3	0.77	0.56	1.01	0.64	0.80	0.79	0.76
Al_2O_3	2.09	1.09	3.04	1.47	2.07	2.04	1.97
P_2O_5	0.05	0.13	0.09	0.05	0.07	0.08	0.08
CaO	48.73	49.52	39.82	49.37	47.78	45.28	46.75
MnO	0.02	0.06	0.02	0.02	0.01	0.02	0.03
MgO	1.60	1.41	5.24	0.81	2.26	2.13	2.24
SO_3	0.29	0.31	0.33	0.04	0.19	0.09	0.21
Na_2O	0.04	0.08	0.41	0.05	0.42	0.06	0.18
K_2O	0.36	0.38	1.10	0.52	0.53	0.40	0.55
Cl-	0.004	0.010	0.009	0.005	0.022	0.018	0.011
Total	99.74	99.74	99.12	99.63	100.30	99.87	99.75

Annex III

TEXT OF AGREEMENT BETWEEN THE FATEYEH CEMENT COMPANY, DERNA, AND UNIDO

1. The Fateyeh Cement Company hereinafter referred to as "the Cement Company" wishing to co-operate with and receive assistance from the United Nations Industrial Development Organization, hereinafter referred to as "UNIDO" will make available in US Dollars, as a trust fund, an initial payment of $US 100,000 at the signature of the present agreement and as the project develops make quarterly payments corresponding to the man/months services delivered, multiplied by an adjustable standard cost, presently calculated as US$ 2,100 per m/m, to cover the services of a team of specialists to be recruited by UNIDO to serve in the company's cement factory in Derna.

2. The Cement Company will pay UNIDO as follows:

   Upon signature of the present agreement, a release from the documentary credit mentioned in the following or a cash payment of US$ 100,000 to be deposited to account No. 29-05321 of UNIDO with the Creditanstalt-Bank-Verein, Vienna International Centre, A-1400 Vienna, Austria indicating that this sum is for trust fund no. TF/LIB/81/008 - Assistance to the Fateyeh Cement Company.

   As coverage of commitments to be made by UNIDO, a documentary credit will be opened for US$ 2.4 million with the above-mentioned trust fund project no. TF/LIB/81/008 - Assistance to the Fateyeh Cement Company as beneficiary. Every 31 March, 30 June, 30 September and 31 December releases from the documentary credit will be made to UNIDO for the services provided during the previous three months calculated as man/months delivered and multiplied by the valid standard cost figure and transferred to UNIDO account no 29-05321 with the Creditanstalt-Bank-Verein, Vienna International Centre, A-1400 Vienna, Austria, indicating that the payment is for trust fund no. TF/LIB/81/008 - Assistance to the Fatayeh Cement Company.

3. The total assistance under this agreement will include the posts listed in the attached budget and the specialization of the experts will be in accordance with the job descriptions issued for respective posts.

4. The specialists will be recruited by UNIDO in accordance with the terms and conditions of services applicable to United Nations personnel. They will in all respects be treated as UNIDO project personnel and will be directly responsible to UNIDO for the conduct of thir duties.

5. Included in the amount to be made available to UNIDO by the Cement Company is a charge of 13% to cover UNIDO's supervisory and administrative expenses and provision for a reserve for compensation payments.

6. For all the UNIDO specialists, national counterparts will be available and as soon as the national counterparts are sufficiently familiar with the routine of their jobs, further extensions for services of the UNIDO specialists may no more be necessary.

7. All costs incurred by UNIDO in connection with this agreement will be borne by the trust fund, including the charge of 13% to be calculated on the total direct project costs to cover UNIDO's indirect supervisory expenses and a provision for the reserve for compensation payments. The costs of the expert's services chargeable to the trust fund will include all salaries and allowances due to the expert under the staff rules of the United Nations and all related expenditures such as, but not limited to, the cost of travel on recruitment and repatriation, or reassignment of the experts and/or their dependents; payment of terminal emoluments, medical costs and travel on official business.

8. The amount contributed by the Cement Company shall be administered by UNIDO in conformity with the financial regulations and rules of the United Nations, particularly 6.6 and 7.3 which govern the financial administration of voluntary contributions and trust funds. UNIDO shall establish a separate account for this contribution and record therein all expenditures attributable to it.

9. As part of the agreement UNIDO will, as soon as possible after the number of UNIDO specialists serving in the factory has reached 60 persons, make available from headquarters costs a full-time cement project co-ordinator to supervise, monitor, report and advise as required during the implementation of the project. In case the number of specialists falls below 60 persons UNIDO may decide to withdraw their co-ordinator.

10. Statements of account showing the status of the trust fund will be supplied to the Cement Company and a final statement will be made on the completion of the project. If the total costs incurred exceed the amount estimated, the Cement Company will then be required to deposit an additional sum to cover the difference. If the actual costs are less than estimated, UNIDO will refund to the Cement Company the amount overestimated. UNIDO may not incur financial liability in excess of the amount deposited to the trust fund, nor make financial commitments nor disburse any funds under this agreement until funds are received.

11. The technical services covered by this agreement will be provided under, and are subject to, the same terms as technical assistance provided for under the Normal Standard Technical Assistance Agreement valid for UNIDO assistance to the Libyan Arab Jamahiriya to which the Cement Company agrees.

12. The total duration of the assignment of each expert will be a minimum of one year and subject to further communication between the authorities and UNIDO, if an extension is found to be necessary.

13. Unless otherwise specified, every UNIDO specialist will be accomodated free of charge by the authorities in reasonable quarters and be provided with free transport to and from the factory at the beginning and the end of duty hours.

14. The interruption of regular payments to UNIDO partly or collectively for the technical-assistance group may be regarded as a decision to dispense with the respective services. In such a case UNIDO will notify the

authorities about the intended action. If no positive action is taken within 30 days from the receipt of the notice, UNIDO will send a second notice, and will consider the agreement as expiring at the end of 30 days from the date of the second notice.

15. This agreement will be subject to prolongation upon the exchange of documents stating the need for extension of technical assistance, clarifying details of required assignments, and making available adequate funds to cover the required extension.

For the Cement Company	Date
For UNIDO	Date

Annex IV

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION PROJECT ESTABLISHMENT AND BUDGET FOR TF/LIB/81/008

COUNTRY: Libyan Arab Jamahiriya

PROJECT TITLE: Assistance to thee Fatayeh Cement Company

PROJECT NUMBER: TF/LIB/81/008/A/32.1.A.

For the start of the above project the following budget ceiling is hereby established.

For budget details see following pages:

	Total	Agency Costs	Programming
UNIDO budget code A	2 984 330	343 330	2 641 000
No previous budget code	-	-	-
Increase	2 984 330	343 330	2 641 000

The establishment of the project with the signatures of the parties on the agreement and on this budget cover, should be followed by a cash payment to UNIDO in accordance with the agreement of US$ 2.4 million and the initiation of quarterly payments in accordance with services delivered considering actual specialists costs and including 13% Agency costs.

Costs per man/months delivered corresponds presently to US$ 2,100 per m/m when rounded of to nearest hundred.

Agreed on behalf of Authorities _____ Date _____

Agreed on behalf of UNIDO _____ Date _____

UNIDO

PROJECT BUDGET/REVISION

3 COUNTRY	4 PROJECT NUMBER AND NUMBER & SPECIFIC ACTIVITY
SYRIA	SYR/[illegible]/81/008/3 [illegible]

5a PROJECT TITLE

Assistance to the Fatayeh Cement Company Derna.

Cathegory A: Calculated 2360 per m/m

10 PROJECT PERSONNEL EXPERTS / [illegible]	16 TOTAL m/m	16 TOTAL $	17 1982 m/m	17 1982 $	18 1983 m/m	18 1983 $	19 m/m	19 $	20 m/m	20 $
11-01 Instr. Engineer.	12	28,320	6	14,160	6	14,160				
11-02 Instr. Engineer.	12	28,320	6	14,160	6	14,160				
11-03										
11-04										
11-11 Shift Leader	12	28,320	6	14,160	6	14,160				
11-12 Shift Leader	12	28,320	6	14,160	6	14,160				
11-13 Shift Leader	12	28,320	6	14,160	6	14,160				
11-14 Shift Leader	12	28,320	6	14,160	6	14,160				
11-15										
11-16										
11-21 Forman Mech.Maint.	12	28,320	6	14,160	6	14,160				
11-22 Forman Mech.Maint.	12	28,320	6	14,160	6	14,160				
11-23 Forman Mech.Maint.	12	28,320	6	14,160	6	14,160				
11-24 Forman Mech.Maint.	12	28,320	6	14,160	6	14,160				
11-26										
11-27										
11-31 Forman Mech.Workshop	12	28,320	6	14,160	6	14,160				
11-32										
11-41 Specialist X-ray	12	28,320	6	14,160	6	14,160				
11-42 " "	12	28,320	6	14,160	6	14,160				
11-43 " "	12	28,320	6	14,160	6	14,160				
11-44 " "	12	28,320	6	14,160	6	14,160				
11-45										
11-46										
11-51 Raw Mat. Engineer.	12	28,320	6	14,160	6	14,160				
11-52 " " "	12	28,320	6	14,160	6	14,160				
11-53										
11-54										
11-61 Mech. Engineer	12	28,320	6	14,160	6	14,160				
11-62 " "	12	28,320	6	14,160	6	14,160				
11-63 " "	12	28,320	6	14,160	6	14,160				
11-64										
11-65										
11-71 Elect. Engineer	12	28,320	6	14,160	6	14,160				
11-72 " "	12	28,320	6	14,160	6	14,160				
11-73 " "	12	28,320	6	14,160	6	14,160				
11-74										
11-75										
11-81 Chemist	12	28,320	6	14,160	6	14,160				
11-82 "	12	28,320	6	14,160	6	14,160				
11-99 SUBTOTAL	300		150		150					
21 REMARKS		708,000		354,000		354,000				

UNIDO

PROJECT BUDGET/REVISION

2. COUNTRY	4. PROJECT NUMBER AND ARABIC SPECIFIC ACTIVITY
SYRIA	SYR/113/81/008/A	32.1.A.

10. PROJECT TITLE

Assistance to the Fatayeh Cement Company, Deir

Cathegory 3: Calculated 1900 per m/m

300 708,000 150 354,000 150 354,000

11. 10. PROJECT PERSONNEL EXPERTS / Post code	14. TOTAL m/m	14. TOTAL $	17. 1982 m/m	17. 1982 $	18. 1983 m/m	18. 1983 $	19. m/m	19. $	20. m/m	20. $
11-101 Control Attendant.	12	22,800	6	11,400	6	11,400				
11-102 Control Attendant.	12	22,800	6	11,400	6	11,400				
11-103 Control Attendant.	12	22,800	6	11,400	6	11,400				
11-104 Control Attendant.	12	22,800	6	11,400	6	11,400				
11-105										
11-106										
11-111 Machine Operator	12	22,800	6	11,400	6	11,400				
11-112 Machine Operator	12	22,800	6	11,400	6	11,400				
11-113 Machine Operator	12	22,800	6	11,400	6	11,400				
11-114 Machine Operator	12	22,800	6	11,400	6	11,400				
11-115 Machine Operator	12	22,800	6	11,400	6	11,400				
11-116 Machine Operator	12	22,800	6	11,400	6	11,400				
11-117										
11-118										
11-121 Instr. Specialist	12	22,800	6	11,400	6	11,400				
11-122 Instr. Specialist	12	22,800	6	11,400	6	11,400				
11-123 Instr. Specialist	12	22,800	6	11,400	6	11,400				
11-124 Instr. Specialist	12	22,800	6	11,400	6	11,400				
11-125										
11-126										
11-131 Quality Contr.Analyst	12	22,800	6	11,400	6	11,400				
11-132 " " "	12	22,800	6	11,400	6	11,400				
11-133 " " "	12	22,800	6	11,400	6	11,400				
11-134 " " "	12	22,800	6	11,400	6	11,400				
11-135 " " "	12	22,800	6	11,400	6	11,400				
11-136 Quality Contr.Analyst	12	22,800	6	11,400	6	11,400				
11-137 " " "	12	22,800	6	11,400	6	11,400				
11-138 " " "	12	22,800	6	11,400	6	11,400				
11-139										
11-140										
11-151 Maint Forman Electr.	12	22,800	6	11,400	6	11,400				
11-152 " " "	12	22,800	6	11,400	6	11,400				
11-153 " " "	12	22,800	6	11,400	6	11,400				
11-154 " " "	12	22,800	6	11,400	6	11,400				
11-155										
11-156										
11-161 Contr. Instr. Forman.	12	22,800	6	11,400	6	11,400				
11-162 " " "	12	22,800	6	11,400	6	11,400				
11-163 " " "	12	22,800	6	11,400	6	11,400				
11-164 " " "	12	22,800	6	11,400	6	11,400				
1900 SUBTOTALS	660		330		330					

21. REMARKS

1,392,000 696,000 696,000

UNIDO

PROJECT BUDGET/REVISION

3. COUNTRY	4. PROJECT NUMBER AND FINANCIAL SPECIFIC ACTIVITY
Syria	SY/[illegible]3/81/003/A 32.1.A.

5. PROJECT TITLE

Assistance to the Fatayeh Cement Company, Deirs.

Category C: Calculated as 1550 per m/m

1284 2,359,200 642 1,179,600 642 1,179,600

10. PROJECT PERSONNEL EXPERTS / Post title	11.	12a. TOTAL m/m	12a. TOTAL $	12b. 1982 m/m	12b. 1982 $	12c. 1983 m/m	12c. 1983 $	12d. m/m	12d. $	12e. m/m	12e. $
11-261 Diesel Mech.		12	18,600	6	9,300	6	9,300				
11-262 " "		12	18,600	6	9,300	6	9,300				
11-263 " "		12	18,600	6	9,300	6	9,300				
11-264 " "		12	18,600	6	9,300	6	9,300				
11-265 " "		12	18,600	6	9,300	6	9,300				
11-266 " "		12	18,600	6	9,300	6	9,300				
11-267											
11-268											
11-271 Quarry Elect.		12	18,600	6	9,300	6	9,300				
-272 " "		12	18,600	6	9,300	6	9,300				
11-273 " "		12	18,600	6	9,300	6	9,300				
11-274											
11-275											
11-281 Operator Pack.Mach.		12	18,600	6	9,300	6	9,300				
11-282 " " "		12	18,600	6	9,300	6	9,300				
11-283 " " "		12	18,600	6	9,300	6	9,300				
11-284 " " "		12	18,600	6	9,300	6	9,300				
11-285											
11-286											
11-99 SUBTOTAL:		1440		720		720					

13. REMARKS

2,601,000 1,300,500 1,300,500

UNIDO

PROJECT BUDGET/REVISION

3. COUNTRY	4. PROJECT NUMBER AND AGENCY'S SPECIFIC ACTIVITY
LIBYA	DP/LIB/81/008/A1 32:I.A.

5. PROJECT TITLE

Assistance to the Fatayeh Cement Company, Derna.

Cathegory C: Calculated 1550 per m/m

660 1,392,000 330 696,000 330 696,000

10. PROJECT PERSONNEL (EXPERTS / Post ONE)	16. TOTAL m/m	16. TOTAL $	17. 1982 m/m	17. 1982 $	18. 1983 m/m	18. 1983 $	19. m/m	19. $	20. m/m	20. $
11-201 Miller	12	18,600	6	9,300	6	9,300				
11-202 Miller	12	18,600	6	9,300	6	9,300				
11-203 Miller	12	18,600	6	9,300	6	9,300				
11-204 Miller	12	18,600	6	9,300	6	9,300				
11-205 Miller	12	18,600	6	9,300	6	9,300				
11-206 Miller	12	18,600	6	9,300	6	9,300				
11-207 Miller	12	18,600	6	9,300	6	9,300				
11-208 Miller	12	18,600	6	9,300	6	9,300				
11-209										
11-210										
11-211 Burner	12	18,600	6	9,300	6	9,300				
11-212 Burner	12	18,600	6	9,300	6	9,300				
11-213 Burner	12	18,600	6	9,300	6	9,300				
11-214 Burner	12	18,600	6	9,300	6	9,300				
11-215										
11-216										
11-221 Maint Mech.	12	18,600	6	9,300	6	9,300				
11-222 Maint Mech.	12	18,600	6	9,300	6	9,300				
11-223 Maint Mech.	12	18,600	6	9,300	6	9,300				
11-224 Maint Mech.	12	18,600	6	9,300	6	9,300				
11-225 Maint Mech.	12	18,600	6	9,300	6	9,300				
11-226 Maint Mech.	12	18,600	6	9,300	6	9,300				
11-227										
11-228										
11-231 Comm. Mech.	12	18,600	6	9,300	6	9,300				
11-232										
11-241 Maint Mech.	12	18,600	6	9,300	6	9,300				
11-242 " "	12	18,600	6	9,300	6	9,300				
11-243 " "	12	18,600	6	9,300	6	9,300				
11-244 " "	12	18,600	6	9,300	6	9,300				
11-245 " "	12	18,600	6	9,300	6	9,300				
11-246 " "	12	18,600	6	9,300	6	9,300				
11-247 " "	12	18,600	6	9,300	6	9,300				
11-248										
11-249										
11-251 Maint Mech.	12	18,600	6	9,300	6	9,300				
11-252 " "	12	18,600	6	9,300	6	9,300				
11-253										
11-99 SUBTOTAL	996		498		498					

21. REMARKS

1;912;800 956,400 956,400

UNIDO

PROJECT BUDGET/REVISION

2. COUNTRY	4. PROJECT NUMBER AND ANNUAL SPECIFIC ACTIVITY
SYRIA	SY/IND/81/008/A | 32.1.A.

5b. PROJECT TITLE

Assistance to the Tatayeh Cement Company Derna.

Cathegory C: Calculated as 1550 per m/m

996 1,912,800 498 956,400 498 956,400

12. 10. PROJECT PERSONNEL EXPERTS / Post no. 11	13. TOTAL m/m	13. TOTAL $	14. 1982 m/m	14. 1982 $	15. 1983 m/m	15. 1983 $	16. m/m	16. $	17. m/m	17. $
11-261 Sheet Fitter	12	18,600	6	9,300	6	9,300				
11-262 " "	12	18,600	6	9,300	6	9,300				
11-263 " "	12	18,600	6	9,300	6	9,300				
11-264 " "	12	18,600	6	9,300	6	9,300				
11-265										
11-266										
11-271 Welder	12	18,600	6	9,300	6	9,300				
11-272 Welder	12	18,600	6	9,300	6	9,300				
11-273 Welder	12	18,600	6	9,300	6	9,300				
I 274										
11-275										
11-281 Workgh. Fitter	12	18,600	6	9,300	6	9,300				
11-282 " "	12	18,600	6	9,300	6	9,300				
11-283 " "	12	18,600	6	9,300	6	9,300				
11-284 " "	12	18,600	6	9,300	6	9,300				
11-285 " "	12	18,600	6	9,300	6	9,300				
11-286 " "	12	18,600	6	9,300	6	9,300				
11-287										
11-288										
11-291 Sheet Fitter	12	18,600	6	9,300	6	9,300				
11-292 " "	12	18,600	6	9,300	6	9,300				
11-293 " "	12	18,600	6	9,300	6	9,300				
11-294 " "	12	18,600	6	9,300	6	9,300				
11-295										
11-296										
11-301 Workgh. Fitter	12	18,600	6	9,300	6	9,300				
11-302 " "	12	18,600	6	9,300	6	9,300				
303 " "	12	18,600	6	9,300	6	9,300				
11-304 " "	12	18,600	6	9,300	6	9,300				
11-305 " "	12	18,600	6	9,300	6	9,300				
11-306										
11-307										
11-311 High Tension Fitter	12	18,600	6	9,300	6	9,300				
11-312 " " "	12	18,600	6	9,300	6	9,300				
11-313										
11-314										
11-99 SUBTOTALS	1284		642		642					

21. REMARKS

2,359,200 1,179,600 1,179,600

UNIDO

PROJECT BUDGET/REVISION

1440 2,601,000 720 1,300,500 720 1,300,500

1. PROJECT NUMBER		16. TOTAL		17.		18.		19.		20.	
		m/m	$	m/m	$	m/m	$	m/m	$	m/m	$
12.01	OPAS Experts										
13.00	Support Personnel										
14.00	Volunteers										
15.00	Experts Travel										
16.00	Other Personnel Costs		20,000		10,000		10,000				
17.01	Locally hired Experts										
17.02	Locally hired Experts										
19.00	Total Personnel Component										
20.	SUBCONTRACTS										
20.00	Total Subcontracts Component										
30.	TRAINING										
31.00	Fellowships										
32.00	Study Tours, UNDP G. Training/Meetings										
33.00	In-service Training										
34.00	Group Training (non-UNDP)										
35.00	Meetings/Consultations (non-UNDP)										
39.00	Total Training Component										
40.	EQUIPMENT										
49.00	Total Equipment Component										
50.	MISCELLANEOUS										
51.00	Operations — Maintenance										
52.00	Reports		20,000		10,000		10,000				
53.00	Sundries										
55.00	Hospitality (non-UNDP)										
59.00	Total Miscellaneous Component										
99.	GRAND TOTAL:	1440	2,641,000	720	1,320,500	720	1,320,500				

US$ 2,641,000 + (13% Agency Costs) US$ 343,330 = US $ 2,984,330

Form/F 0 33/Rev 3/Add 1/Rev.1 (3.79)

Annex V

DETAILS OF THE INTERREGIONAL CEMENT TECHNOLOGY FORUM

A. Participants from developing countries

Algeria
1. Abdullaoui Benyoucef
2. M. Benarab Youcef

Angola
3. Mawungo Joao

Chad
4. Zozabe Issaya
5. Nadjinabe Robongeael Eloi

China
6. Li Jing Xing
7. Fang Run

Democratic Yemen
8. Salem Al Ammari
9. Awad Saeed Bin Ghouth

India
10. Mohammad Ibrahim Siddiqui
11. D.P. Narayan

Iran (Islamic Republic of)
12. Esmail Habib Ollahzade

Mozambique
13. Ferdinando Gustavo Brunhein
14. Helder Vladimiro Rodrigues

Philippines
15. Roberto Reyes
16. Domingo Virey

Poland
17. Wieslaw Stefan Kurdowski

Syrian Arab Republic
18. Adb El-Karim Hajj Issa

Thailand
19. Santhan Chaiphunviriyaporn
20. Jumpol Ritthichai

Turkey
21. Guner Alkan
22. Turker Bozunogullari

Uganda
23. Charles Odong

B. Participants from host country

Secretariat of Heavy Industries

1. Omar M. El-Montaser
2. Ali M. El-Gheriani
3. Mohamed M. Yazid
4. Khalifa El-Bueishy
5. Mahdi Dakhil
6. Mohamed El-Taher
7. Abdel Fattah Ben-Arous

Secretariat of Planning

8. Saad El-Arial

Secretariat of Housing

9. Mahmoud El-Kekhia

Secretariat of Public Utilities

10. Ali M. Ibrahim
11. El-Zarrouk Bu-Dagaga

Research Centre (Gar Yunis University)

12. Salem Bazina

Faculty of Engineering (Gar Yunis University)

13. Nazem El-Nazer
14. Hassan Abdel-Karim
15. K.G. Kaddan
16. M. Ibrahim El-Abbud

Industrial Research Centre

17. El-Siddiq El-Zindah
18. Mahmoud Abu-Shweireb

Special Training Centre

19. Ahmed El-Dursi
20. Awad Brayek
21. Rostom Loutfy

The Libyan Cement Company, Benghazi

22. Ezzeldin El-Ghadamsi
23. Mohamed El-Neihoum
24. Ali Fathi
25. Abdel-Latif Gum'a

26. Abu-Bakr El-Saltani
27. Ahmed Bu-Setta
28. Muftah Ben Zablah
29. Saad Heikal
30. Ali Ruhaim
31. Wahbi Abdel Samad
32. Sobhi Mohamed
33. Omar El-Kekhia
34. Saleh Moussa
35. Mansour Ben-Shoroud
36. Mohamed Salim Azzouz
37. Ali Hammad
38. Ali El-Gamaawi
39. Ali El-Famas
40. Mohamed El-Hammali
41. Farag El-Soufi
42. Ahmed El-Rubaa
43. Hassan El-Tabbouli
44. Muftah El-Mughrabi
45. Abdul-Latif Abdul-Rahman
46. Soliman El-Kenawi

Souk-El-Khemis General Company for Cement and Building Materials

47. Mohamed Gannour
48. Bashir Ammar
49. El-Mahdi Hafaf
50. Ali Musbah Saleh
51. Juma M. Hunder
52. Salem El-Akari
53. Mohamed Sherif Monier
54. Abdel-Munem I. Abdel-Kader
55. Ramadan Ashour
56. Moh. Mahmoud El-Kadi

National Company for Cement and Building Materials

57. Abdel Salaam El-Jawadi
58. Mahmoud Fraij

Libda Cement Works

59. Mustafa El-Tafouh
60. Hassan El-Rifai

El-Fatayeh Cement Project

61. Abdel-Razig El-Ghazali
62. Gadalla El-Shilwi
63. Abdel Nasser Gamila
64. Mohamed El-Feitouri
65. Moh. El-Hasadi
66. Saleh El-Gahwagi
67. Darwish F. Mohamed
68. Abdel-Salaam Saleh
69. Abdul-Salaam El-Frates

C. List of lecturers

France

Guy Noel Masson (LAFARGE)

Germany, Federal Republic of

Rudolf Kuhs (KHD)
Wilfried Droste (KHD)
Helmot Wuestner (KHD)
Gernot Heinrich Schaefer (BEUMER)
Hans Georg Lowag (HAVER and BOECKER)
Peter Karl August Kuppier (REFRATECHNIK)
Eckhard Josef Hobrecht (REFRATECHNIK)
Erwin Jakob Koetter (REFRATECHNIK)
Raymond Josef Jaques Bonkirch (DEMAG)

Libyan Arab Jamahiryia

Ali M. El-Gheriani (SHI)
K. Kaddan (GAR YUNIS UNIVERSITY)
Ahmed El-Dursi (TRAINING CENTRE)
Ali Fathi (LCC)
Abdel-Latif Gum'a (LCC)
A.R. Marei (UNIDO)

Poland

Wieslaw Stefan Kurdowski (ACADEMY)

Switzerland

Jacques Hoffmeyer (PEG)
Alfred Bruegger (PEG)
Klaus Alexander Kayatz (HMC)

D. Titles of papers given at the forum

The development of the cement industry in the Jamahiryia (Ali M. El-Gheriani, SHI)

UNIDO assistance to development and consolidation of the cement industry in developing countries (Secretariat of UNIDO).

Mining methods and advantages of using hydraulic excavators (Raymond J. Bonnkirch, DEMAG).

Criteria for the selection of grinding mills (Helmut Wuestner, KHD).

Conditions necessary for establishing a new cement plant or extending existing production capacity (Jacques Hoffmeyer and Alfred Bruegger, PEG).

High-alumina cement as a building material (K.G. Kaddan, GAR YUNIS UNIVERSITY).

Oolitic limestone for use in the cement industry in North Africa (A.R. Marei, UNIDO).

Development of rotary kilns with the Humboldt preheater (Rudolf Kuhs, KHD).

Development and programme of the training centre in Benghazi (Ahmed El-Dursi, TRAINING CENTRE).

Performance of volatile substances in the kiln and some problems resulting from high clinker temperature in cement production (Wieslaw Kurdowski, ACADEMY).

Grindability and burnability of oolitic limestone (A.R. Marei, UNIDO).

Evolution of cement-burning technology in cement rotary kilns and development of the refractory kiln lining (Peter Karl Kuppier, Eckhard Josef Hobrecht, and Erwin Jacob Koetter, REFRATECHNIK).

Experience with cement training centres (Klaus Alexander Kayatz, HMC).

Pollution and electrofilter problems (Abdel-Latif Gum'a, LCC).

Present state of basic refractory lining of the sintering zone (Peter Karl Kuppier, Eckhard Josef Hobrecht and Erwin Jakob Koetter, REFRATECHNIK).

The avoidance of cement aggregation in the Libyan Cement Company's storage silos (Ali Fathi, LCC and A.R. Marei, UNIDO).

Modernization of packing plants with automatic truck-loading equipment and palletless shrink-wrapping lines (Gernot Heinrich Schaefer, BEUMER).

Improvement of existing cement factories (Guy Noel Masson, LAFARGE).

Installation of the refractory lining and some associated problems (Peter

Karl Kuppier, Eckhard Josef Hobrecht and Erwin Jakob Koetter, REFRATECHNIK).

Modern packing and loading installations with automatic bag placers. Cement terminals, floating and land-based (Hans Georg Lowag, HAVER and BOECKER).

WARTAS preventive maintenance in cement factories (Wilfried Droste, KHD).