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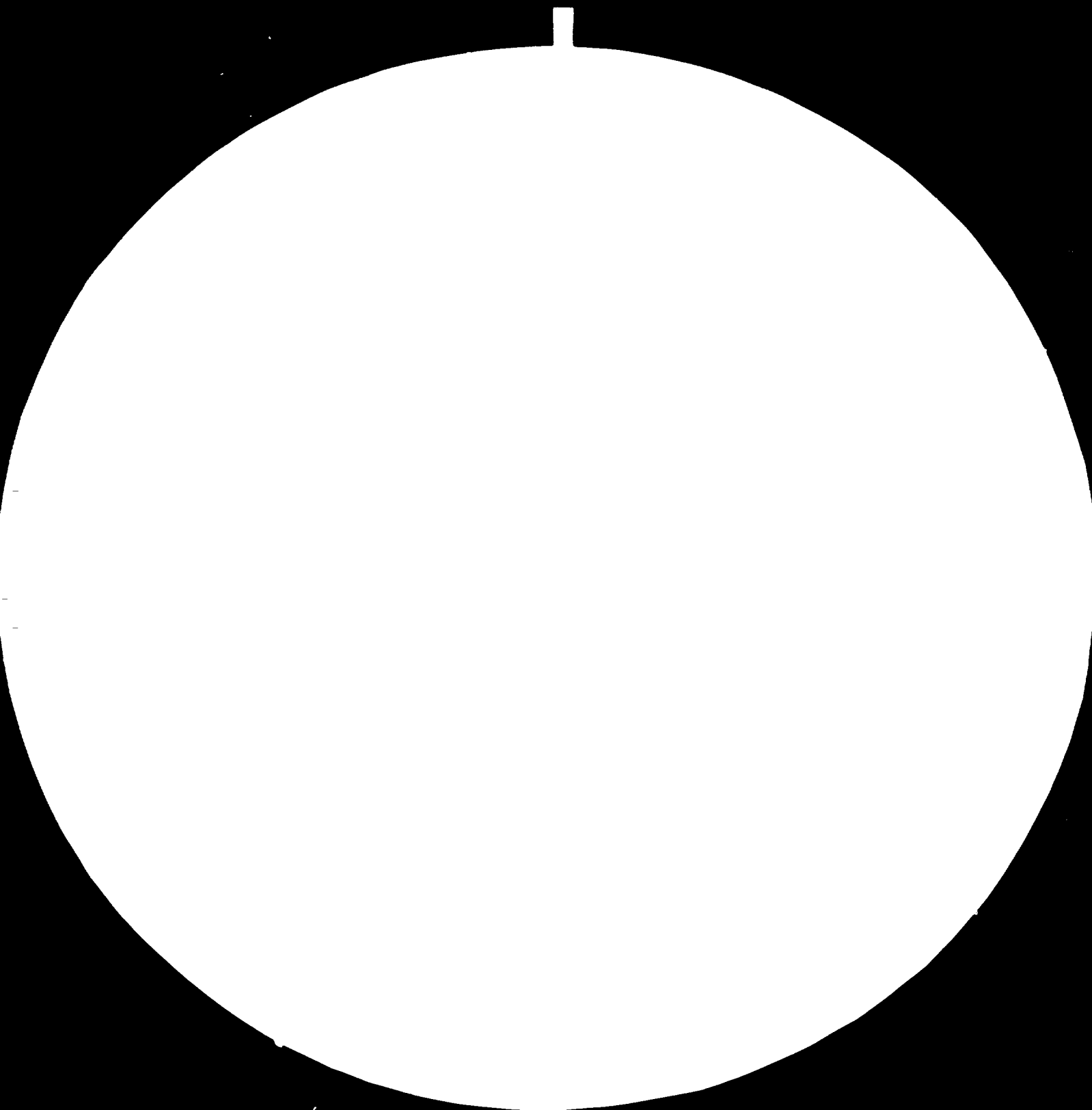

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# ASSISTANCE TO CONSOLIDATE AND DEVELOP THE BENGHAZI CEMENT FACTORY

TF/LIB/75/002

SOCIALIST PEOPLE'S LIBYAN ARAB JAMAHIRIYA

Based on the work of Boguslaw J. Walczenko,
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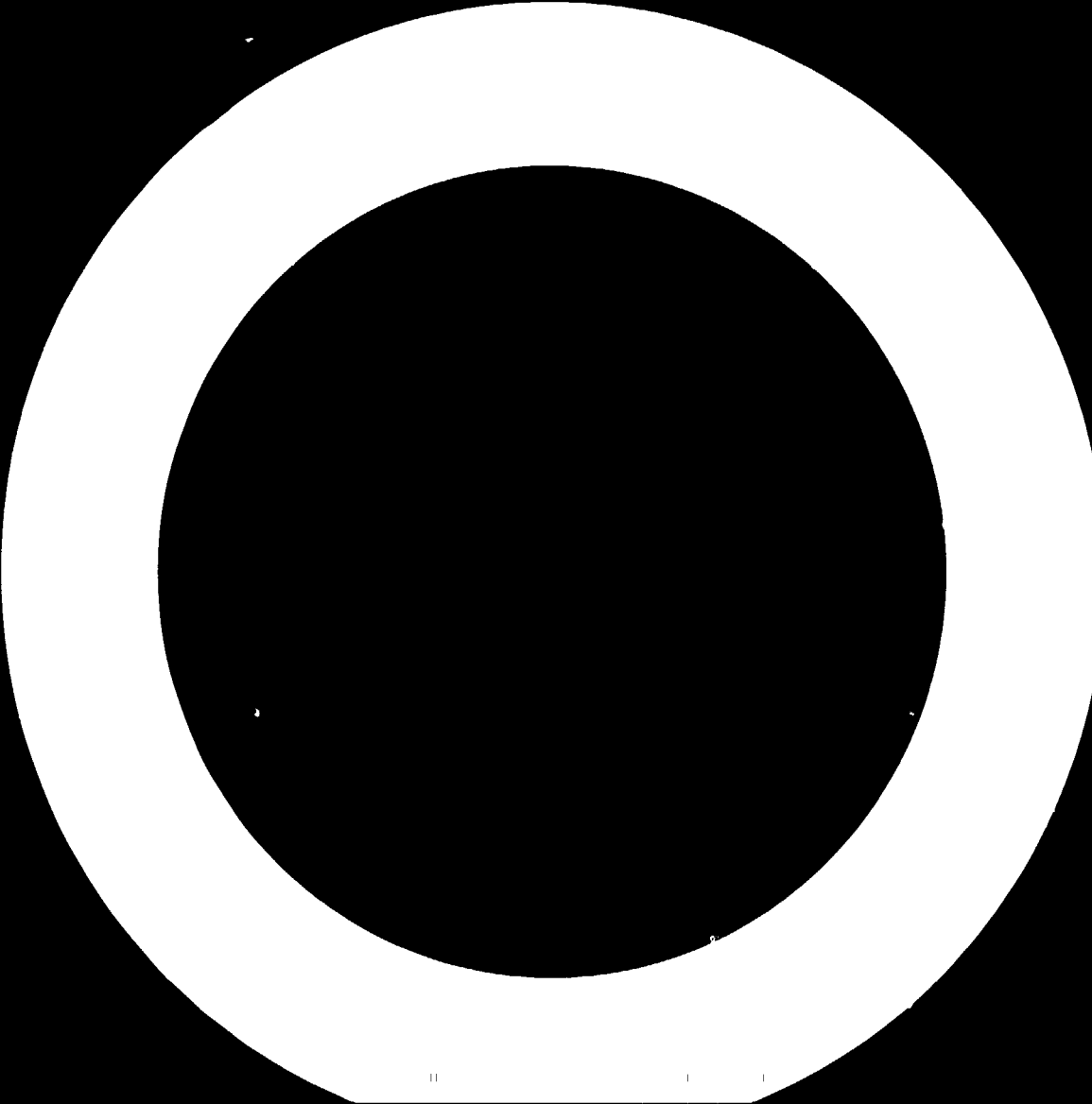
## ABSTRACT

This report covers the six-month extension of a prior mission (TF/LIB/75/002) carried out by the expert from July 1978 to July 1979. The report covering the above-mentioned period has been submitted to UNIDO, the United Nations Development Programme office in Tripoli and the Libyan Cement Company.

During the six-month period, the expert was helping to execute the maintenance plan and to remedy various defects, checking electrical documentation and spare parts, and training a new group of electricians. A new instrumentation workshop was also organized and put into operation.



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## INTRODUCTION

This report covers the extension period of a mission designed to consolidate and develop the Benghazi cement factory (TF/LIB/75/002). The mission was carried out under the Second Trust Fund Technical Assistance Agreement Projects requested by the Government of the Socialist People's Libyan Arab Jamahiriya.

The aim of the project was to assist the electrical engineering staff of the Libyan Cement Company in organizing and carrying out maintenance work, and in the calibration and testing of measuring and control equipment.

The Hawari cement factory, constructed under turnkey contract, was provisionally taken over during August, 1978, and is still covered by guarantee. This fact has special implications for its exploitation. The original mission concentrated more on the establishment of effective maintenance plans. During the extension period the expert executed maintenance plans, supervised the introduction of improvements recommended in the first report, and took part in tests on defective items. Orders for spare parts were prepared to ensure the safe running of the factory, and the new workshop for repairing electronic instruments was established.

## PROJECT ACTIVITIES

### Instrumentation

Only two experts remained with the instrumentation maintenance section during the period from July to November 1979. Two UNIDO experts previously assigned to the Hawari cement factory as instrumentation specialists were reassigned as electricians because of staff shortages. Such limited manpower made routine maintenance services difficult.

The UNIDO experts often completed their work after one year at the cement factory, when their services began to bear fruit, and it has proved difficult to provide suitable replacements for them. The selected stand-by experts should therefore be made available as soon as possible.

The suggestion contained in the previous report concerning the need to establish a central workshop for monitoring and measuring instruments has not yet been carried out. The expert made strenuous efforts to secure proper accomodation where it would be possible to repair precision measuring instruments. A small air-conditioned room (12 $m^2$) was finally made available by the X-ray laboratory.

In July 1979 the room was adapted for the needs of the workshop. A measuring panel designed by the expert has been placed on the wall over the laboratory table. The panel is supplied with 24V DC/AC and 220V AC, and has a constant voltage regulator with a possibility of adjustment up to 30V. Both fluent and continuous measuring are possible.

The universal digital device is a versatile measuring instrument. Various other portable devices, such as testing instruments for 20-A system, resistance decade, and pressure adjusters, have been obtained by the workshop.

A frame with a power supply unit, similar to those installed in the cubicles with electronic cards for the dosing system, has been mounted. The frame was delivered by the producer of dosing systems suggested by the expert. The installation makes it possible to check the electronic cards quickly and facilitates their mending.

Eighty-four volumes of technical documentation were gathered and classified so as to shorten the time of repairs.

The location of the workshop near the central control room facilitates communication with the operators, thus making it possible to act quickly in case of an emergency. A telephone is also available. A workshop furnished

in such a way extends the possibilities of repair and maintenance of precision measuring instruments and makes it unnecessary to resort to expensive servicing by the producer. How er, the best solution would still be to build one central instrumentation workshop for the whole company.

## Performance and maintenance

The plans for periodic surveying of the measuring points have been implemented. As a result, it has been possible to eliminate unnecessary delays arising from the faulty operation of measuring instruments. During the inspections, devices which threatened to break down in the near future were often discovered. Such equipment was replaced if spare parts were available, or an order was immediately placed with the manufacturer for a missing part.

All the measuring points were checked for measuring ranges and accuracy by means of testing instruments. Regular checking and calibration of carbon monoxide (CO) and carbon dioxide ($CO_2$) is of supreme importance because there is always a danger of the development of an explosive gas mixture which may blow up the electrofilters.

Periodic checking and taring of the dosing weight meters eliminate the possibility of an improper dosing of material which could cause the overfilling of the mill.

In attending to the proper operation of the weight meters, the regular cleaning of the cubicles with electronic cards has been also ensured.

These and other measures have eliminated the serious defects described in the previous report.

## Improvements

In the course of operation many improvements are made in order to avoid delays caused by incorrect assembly or usage. In particular, the following measures were taken:

(a) The control of the measurement of the level of cement in the silos was changed. As a result, mechanisms do not wear out so quickly and the number of changes needed is reduced;

(b) The control circuits of motorized valves in regulation loops for burner oil temperatures were changed, thus improving the reliability of the regulation system;

(c) The signal devices for automatic operation of the greasing system for kiln thrust rollers were completely changed;

(d) Protecting covers were built for pyrometers in the kiln heads and in the inlet chambers to avoid possible damage.

## Defects

Although many defects were corrected during the first year of the warranty period, much still remains to be done. The supplier had difficulties with both staff and materials, while during routine operations further problems arose.

With regard to technological installations, there were serious breaks in the shells of two mills, and frequent breakage of electrodes took place within one month.

Routine operational defects and those noticed in the course of maintenance were reported to the management of the electric department. Some of the more serious points reported are listed below:

(a) Faulty installation of cables in the immediate vicinity of high temperature lines which caused overheating and damaged the electrical devices;

(b) Defects in the change-over switch system in the master unit for remote control of flaps. The supplier has been requested to send 100 new change-over switches;

(c) Because of the short life of plastic gears in the transmission of recorders, the manufacturer had to send 100 metal gears for replacement;

(d) Misconnection of the control loops of stone and clay crusher;

(e) Frequent damage to the pneumatic control of sampling post devices because of the poor air quality;

(f) Scales of indicators which do not cover the measuring ranges of analysers;

(g) Absence or unsuitability of labels on the control panels;

(h) Faulty system of cooling the pyrometers controlling temperatures in the inlet chamber.

## Spare parts

About the beginning of July 1979 the representatives of suppliers, consultants and the Libyan Cement Company calculated the amount of the spare parts consumed during the first year of exploitation. An analysis of the document shows that most of the spare parts destined for the two-year guarantee period were consumed.

The supplementary list of electrical spare parts required to complete the quantities recommended in the control and to keep the factory running has been prepared. A second list of the electrical spare parts ordered by the technical assistants has been also prepared. Those parts were ordered to supplement the control quantities or replace the parts consumed during exploitation.

The third list contains the recalculated quantities of electrical spare parts that the LCC electrical department considers necessary to ensure continuous operation of the factory.

Although the material called for in the first and second lists has been ordered, the cement factory supplier has been unwilling to provide those contained in the third list, on the grounds that he would exceed his authority in doing so. The supply of the materials is proceeding very slowly.

In those circumstances, the author started to prepare orders for the most urgent spare parts and materials, such as chart paper for records, pen cartridges for recorders and signal lamps. To make it easier to prepare orders, special schedules for chart papers and recommended minimum stock levels have been suggested. Schedules have also been prepared for 25 types of signal bulbs used in the factory. Because of a lack of skilled staff responsible for ordering supplies, engineers are still involved in such work.

## Electrical documentation and drawings

The electrical documentation and drawings are still unsatisfactory. Some of them contain numerous errors and others are missing. Sixteen sets of documentation were delivered in September 1979 as a result of previous recommendations by the expert. All the electrical drawings are contained in 84 volumes. In order to facilitate the use of the documentation, an index was made and all the volumes were systematized and numbered. Such an arrangement makes it easier to find each volume on the shelves. The sets of drawings have been distributed to the electrical department, the rooms of the electrical engineers and shift electricians, and the instrumentation and electrical workshops. The remaining volumes have been placed in the room assigned for the library of technical documentation.

Electrical documentation (catalogues of the applied systems) has been provided to the electrical department, the electrical engineers, and the technical library.

Both the documentation and drawings are checked and all defects or errors are reported to the supplier.

## Coping with a flood in the underground electrical rooms

On 5 November, a violent rainstorm flooded the rooms below ground level and the dispatcher room under the central control panels. Thousands of relays for central control circuits and electronic transmitters for measuring circuits

were covered with water which came into the room through the cable subways. The cable subway system covers the whole factory area, its lowest level being at the dispatcher room. It took several days to pump out the water and to remove, check and dry the thermostatic stoves and reinstall the flooded equipment. Since 95 per cent of the devices were saved, the factory was operating again after 10 days. Protective measures were undertaken to avoid a repetition of such a disaster. Cable subways were sealed in some places, and a building company was asked to extend the storm water drainage system outside the factory area.

Breakdown of production

The main reasons for production stoppages were as follows:

(a) Loss of skilled local workers recruited for the army;

(b) The breakdown of two cement mills because of their faulty construction;

(c) Frequent short circuits in the electrostatic precipitators caused by cracking of electrodes;

(d) Irregular supplies of cement from the packing plant;

(e) Interruptions in the supply of electricity.

A break in the production cycle also disrupted the execution of the maintenance plans. When production was stopped installations were overhauled by mechanical workers and instrumentation specialists, which made it difficult to execute the previous work plans. On the other hand, measuring and control devices were checked by the instrumentation specialist to ensure a trouble-free resumption of technical operations. Irregular operation of production lines