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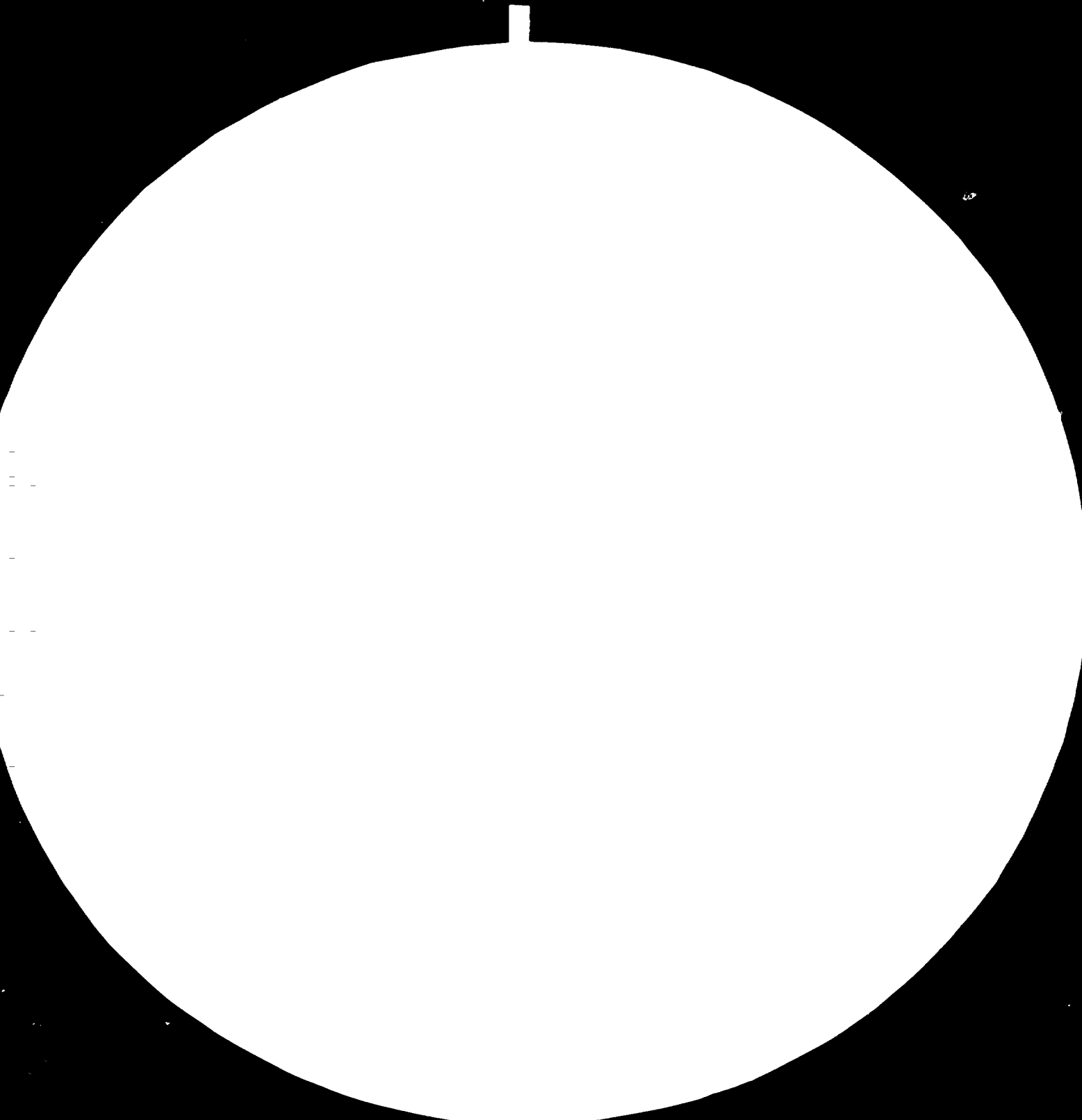


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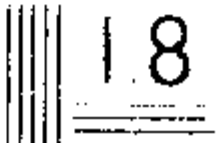
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DAMASCUS, 28 November 1981

ASSISTANCE TO THE DEVELOPMENT OF THE CONSTRUCTION AND BUILDING MATERIALS INDUSTRIES - DP/SYR/80/001 - SYRIAN ARAB REPUBLIC.

TECHNICAL REPORT: Syria. ASSISTANCE IN MAINTENANCE IN THE CEMENT INDUSTRY.

PREPARED FOR THE GOVERNMENT OF THE SYRIAN ARAB REPUBLIC BY SIGMUND ABAFFY, UNIDO EXPERT.

(11 - 05 AND 11 - 06)

This report has not been cleared with the Syrian Authorities nor with UNIDO or UNDP Officials which does not therefore necessarily share the views expressed.

INTRODUCTION

The General Organization for Cement and Building Materials in the Syrian Arab Republic is extending its production facilities to meet market demands. The existing plants' capacity is not being used at optimum level. The G.O.C. therefore sought assistance from UNIDO in this connection. It is assumed that lackness of the preventive maintenance in electrical and mechanical equipments in the cement factories is the main factor not to reach the optimum capacity level. The electrical and mechanical maintenance are very much interrelated. Bearing this fact in mind and upon the request of the Syrian Government the two six months assingments (posts 11-05 and 11-06) originally envisaged in the project document to be carried out by two experts has been carried out only by one expert in the last 12 months who was fielded in January 1981.

The expert's duties and further background information are given in the Job Discriptions of the posts 11-05 and 11-06. Annex 1 2 . The first periodical report is attached as annex Nr. 3 and the second periodical report concerning the Adra Plant is attached as annex Nr. 4.

The note with reference to the expert's visit in Mussulmieh is attached as annex Nr. 5.

It has to be mentioned that much more effective results could be acheived if the expert would have a counterpart as it was agreed. Unfortunately his first counterpart Eng. Farouk Awwad was given other duties in April 1981 and later left the G.O.C. His second counterpart Eng. Abdulla Mouslli left the G.O.C. in September. Both were excellent engineers who could carry further the expert's duties.

SUMMARY

Electrical and mechanical, preventive and general maintenance can only be planned if a "Facility Register" exists, i.e. a complete inventory of the items required to be maintained.
As such facility registered apparently do not exist at the cement plants, the expert has concentrated his efforts to advise regarding establishment of such a register as first step towards planning of preventive and General Maintenance.

FINDINGS

The expert visited two cement plants with the purpose of familiarizing himself with the systems and planning procedure used at these factories for preventive and general maintenance.

To be able to plan any preventive or general maintenance of a cement plant it is necessary to have a very complete inventory of the equipments to be maintained.

After visits to the plants he found that as a general rule such Facility Register inventory was not exist.
Filing of drawings, instructions, lubrication charts, maintenance instructions etc. are substantial parts of the "Facility Register" and consequently the filing of these documents will have to be correctly organized.

The writer found a positive understanding and interest in the suggestions which he discussed with the staff of both plants.

RECOMMENDATIONS

Organizing one or more groups to assist the cement factories in establishing the basical "Facility Register" -s. This work will have to be carried out at the various cement plants with a central coordinator at headquarters in Damascus.

These groups will have to work completly independent of the staff members at the cement plants, i.e. they will take no part in the daily works dealing with maintenance. On the other hand, these groups will depend 100% upon the informations they can gather from existing files, archives, records and to

a great deal from the informations which the production staff can give from their notes, their personal technical records and files and from their memory. Also all necessary filing cabinets, hanging folders stationary such as printed record cards, journal for listing drawings and instructions will have to be on hand. After the first briefings by the headquarters coordinator the basical code system will have to be laid down in such a way that a certain uniformity amongst all cement plants is aimed at, but also trying to establish such a system, which takes advantage and consideration to possible existing systems.

When all the above mentioned centralized spade work has been carried out the work groups will have to go out and collect the needed informations and establish the "Facility Registers". The future planning for possible preventive and general maintenance can only begin when the basic informations are collected and recorded.

In some plants maintenance control is the sole purpose of the register in others the cards provide varying degrees of financial information as well, so that the depriciation of the plant and additions to the plant item may be recorded, and continuous record made of the standing value of the plant item.

The "Facility Register" is the very heart of the planned maintenance system

and many plants consist of a simple single-drawer file cabinet that contains the whole system.

Any system has to be appropriate, i.e. suitable for the actual situation, but always with an eye on possible improvements. It has to be simple and flexible. The writer has again and again experienced that systems are introduced which even in the so called 'developed countries" have proved too sophisticated and theoritical perfect to have any practical value. To use of a very complex numbering systems for the equipment with multi-digital numbers, difficult to remember in the everyday work and with a great chance for human errors should be avoided. These multidigital code numbers are needed when a preventive maintenance system is based on the use of computerized data processing but should be avoided in simple and flexible systems. Making the systems all too "rigid" demanding too much paperwork, control and double control, cards and copies, from perfect good foremen, mechanics and maintenance personnel with plenty of work to do, but very often with certain problems when it comes to writing and reading, is dangerous. Planning need paperwork but is has to be organized in an appropriate way.

When organizing the "Facility Register" one has to distinguish between two situations:

1) Organizing for a new plant

2) Organizing for a plant already running for a number of years.

When organizing the "Facility Register" for a new plant the information going into the files should be drawn from the information and experience which the supplier of the equipment and not the contractor should turn over to the customer. Also their experience regarding the need of spare parts, lubrification etc.; The establishment of a new plant as matter in fact provides a rare opportunity to design an appropiate maintenance system and to introduce it during the implementation of the project.

When organizing the "Facility Register" for a plant running for a number of years the information which is needed comes from what might be found in existing files from the days of implemetation and very often from the memory of the personnel. Consequently a much more difficult procedure with more chances for mistakes and misleading information.

What will now have to go into such a "Facility Register"?

All informations pertinent to the unit in question i.e.

A all datas such as name of manufacturer, serial number and other details of the unit, a description of the equipment.

B information about the recommended spare parts, existing spare parts and where to be found.

C Complete history of the unit from the day of building and erection with detailed historical informations regarding repaires carried out, reasons for repairs, date of repairs, all to make further preventive planning possible.

D information regarding where to find manufacturers' instructions and/or pamphlets, drawings etc.

E information on existing stock of spare parts, information on minimum stock of spare parts needed, either according to the suppliers' (AMK) experience or/and according to experience during the time the unit has been working under production conditions.

Schedules to be prepared listing the requirements of of each item shown in the "Facility Register" in so far as routine maintenance is concerned. At the plants visited in Syria maintenance planning is taking place in one way or another, but at all plants it is agreed by the staff that an effective "Facility Register" is badly needed and the expert has consequently concentrated his efforts on his mission on advising how to clear the register as background for any future attempts to organize preventive and general maintenance.

Practical suggestion for a filing system for "Facility Register".

The importance of and the reasons for simplicity of a such register is obvious regardless the circumstances and the country in which it will be organized.

First of all it has to be appropriate. Also the cost of organizing the system has to be considered.

Filing of information regarding the equipments:

a) each machine will have to be given a number independent of any serial number given by the manufacturers. The number should be simple to lessen the chances for errors. Also when marking and identifying machines the number should be as simple as possible.

   The first one digital should indicate the section inside the plant where item is erected and the following ones should just be numbers in succession.

b) in principle each equipment will have one hanging file charteque with the number on it containing all informations regarding to the equipment.

c) all instructions spare part lists, maintenance instructions, directions for using the equipment should be enclosed.

Long term objective: Headquarters in Damascus should have a copy of all these registration numbers possibly filing copies of all original drawings of importance produced at the plants as spare-parts for local production.

When the "Facility Register" is functioning to the accepted methodology it will be possible after some years to draw from these informations and plan a real preventive maintenance.

"Prevention is better than cure". Consequently the system will have to be used in such a way that repairs and replacements of spareparts and general maintenance will have to be planned ahead of any "accidents" to avoid breakdowns which might cause stand stills not only of the equipment in question but also of all other equipments and sections depending on the machine.

When a unit has to be repaired planning should be the background for carrying out other maintenance on equipment related to the unit.

SUGGESTION for code numbers for sections of a cement plant

1: Quarry and precrushing

2: Secondary crushing and storage

3: Preparation of rawmix (a)

4: Kiln section (b)

5: Clinker storage and handling

6: Grinding of clinker to cement (c)

7: Cement storage in handling despatch

8: Power plant or substations, electric motors (d)

9: Workshop

10:Spare parts and stoes

11:Laboratory

12:Water supply

Footnotes

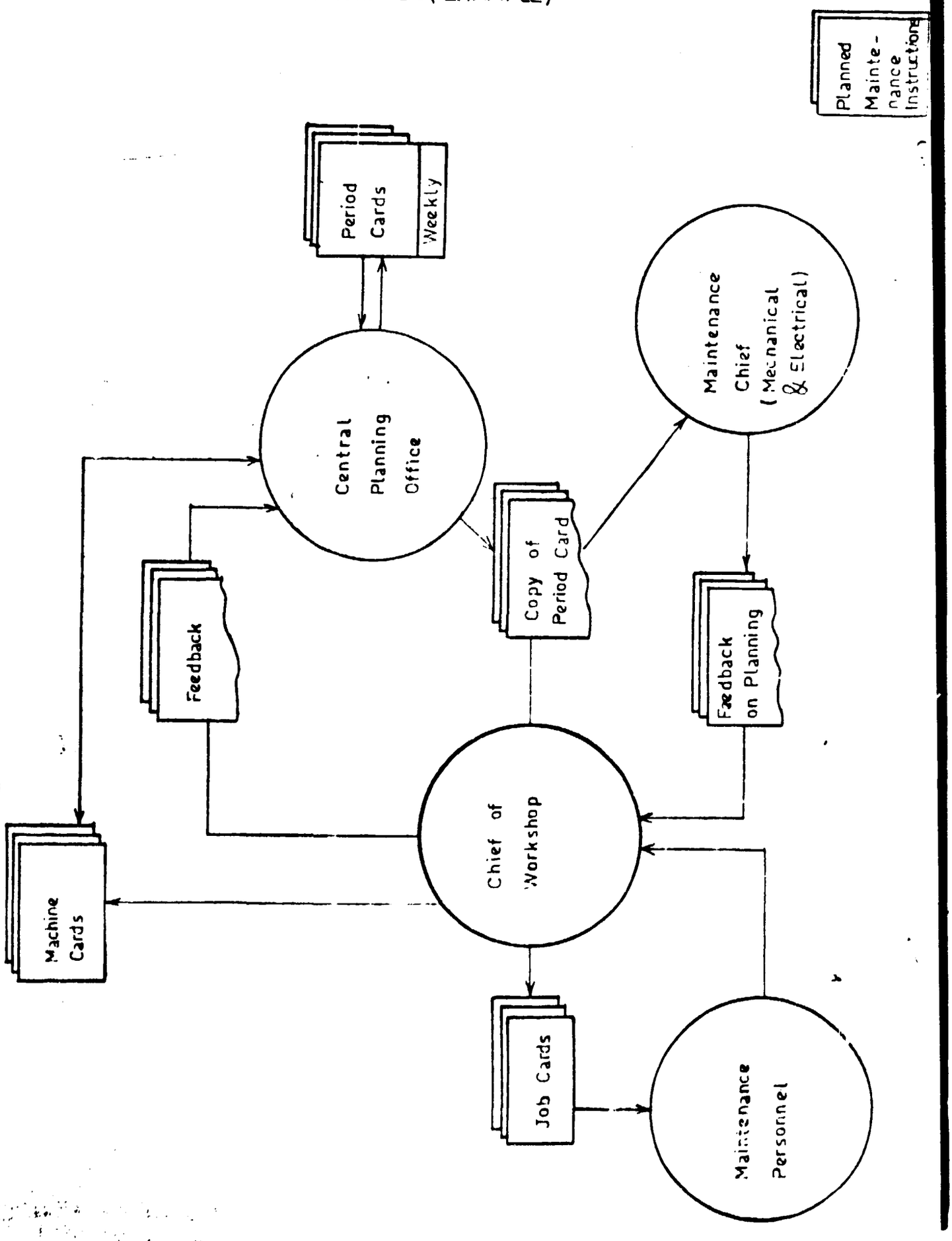
a) as rawmix is understood the material going to the kiln section for producing clinker. The section includes homogenization.

b) Kiln section includes: possible pelletising, lepol grates, predrying systems, calcinators etc. and ends with outlet of clinker cooler and crushing.

c) Includes clinker transport to storage, transport of clinker to cement mill and storage handling of gypsum.

d) when the motors do not form an integral part of the equipment.

Figure: HOW THE SYSTEM OF PREVENTIVE MAINTENANCE WORKS.(EXAMPLE)



ANNEX NR. 1

UNITED NATIONS

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNIDO

26 September 1980

PROJECT IN THE SYRIAN ARAB REPUBLIC

JOB DESCRIPTION INTERNAL

DP/SYR/80/001/11-05/32.1

Post title	Mechanical Engineer for the Maintenance of Cement Machinery
Duration	Six months
Date required	As soon as possible
Duty station	Damascus, with travel within the country

Duties

The expert will be assigned to the Government and delegated to assist the Cement Indurtry. Specifically, the expert is expected to:

1. Supervise regular mechanical maintenance, occasional repairs and general overhauling;
2. Maintain registers for recording details of maintenance and repairs for illustration of life history for machine parts and applied spares;
3. Establish periodical statements for maintenance requirements of materials and labour force;

4. Follow up greasing and oiling programmes and revise particulars on lubricants;
5. Inspect the mechanical behaviour of machinery and equipment and adopt technological solutions for eventual anomalies;
6. Participate in implementing the modifications in order to improve productivity;
7. Supervise new erection work complying with general plans and possibilities for future extensions;
8. Rationalise the operation of workshop machines to achieve the best productivity;
9. Introduce the local manufacture of simple spare parts in the workshop of LCC or through local facilities;
10. Evaluate offers and analyse tenders, taking technical and economic factors into consideration;
11. Organise training programmes for mechanical maintenance personnel whether by participation in training seminars or on-the-jop training seminars;
12. Implement industrial security principles for personnel and machinery;
13. Report on the activities of mechanical maintenance and workshop, efficiency of personnel and suggest measures for improvement;
14. Rationalise the application of spares and maintenance materials and establish economical principles through rational use or through quality promotion.

The expert will also be expected to prepare a final report, setting out the findings of the mission and recommendations to the Government on further action which might be taken.

QUALIFICATIONS University degree in Mechanical Engineering; wide experience in the field of the mechanical maintenance of cement-making machinery

LANGUAGE English

BACKGROUND INFORMATION The development of Infrastructure, Industry, Housing and Agriculture depends heavily on the availability of Portland Cement, Fortunately, the country has all basic raw materials within its borders, which are required for production of this commodity.

Industrial production of cement started in 1934 and other cement plants followed after 1945.

The most recent and still on-going development of the cement industry started in 1968/69 with projections for future demands and negotiations with foreign consultants and suppliers for geological, chemical and technical studies for new cement plants together with studies for the expansion of some of the existing plants.

The Government policy in the field of cement is to make the country independent of cement imports and to satisfy all cement requirements, through local production, for the development of Infrastructure, Industry, Housing and Agriculture.

NO CANDIDATES REQUIRED AT THIS TIME

ANNEX NR. 2

UNITED NATIONS

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNIDO 26 September 1980

PROJECT IN THE SYRIAN ARAB REPUBLIC -

JOB DESCRIPTION INTERNAL

DP/SYR/80/001/11-06/32.1.K

Post title	Electrical Engineer for the Maintenance of Installations etc.in the Cement Industry
Duration	Six months
Date required	As soon as possible
Duty station	Damascus, with travel within the country
Duties	The expert will be assigned to the Government and delegated to assist the Cement Industry. Specifically, the expert is expected to:

1. Establish programmes for electrical maintenance and general overhauling;
2. Inspect electrical equipment, ensure proper operation and rectify any eventual anomalies or disorders;
3. Supervi e electrical maintenance and repairs and give technical advice for the rationalisation of maintenance procedures;

4. Supervise the erection of new electrical installations, study loads for new machinery and equipment and plan the power supply;
5. Study the modifications required to be carried out on the electrical equipment and participate in their execution in accordance with approved schedules;
6. Supervise the electrical workshop in order to accomplish the required maintenance and production services;
7. Prepare the lists of spares and materials required for electrical maintenance, point out the minimum and ordering stocks and maintain records of maintenance particulars and consumption of spare parts;
8. Establish economical standards for electrical maintenance and workshop requirements and rationalise the application thereof;
9. Evaluate offers from a technical and economic point of view:
10. Revise the electrical power consumption;
11. Take necessary measures for industrial security to ensure the safe operation of machinery;
12. Report on the electrical maintenance and workshop activities;
13. Organise training programmes for the training of personnel whether through training seminars or on-the-job training.

The expert will also be expected to prepare a final report, setting out the findings of the mission and recommendations to the Government on further action which might be taken

QUALIFICATIONS University degree in Electrical Engineering (Power), with wide experience in electrical maintenance in an industrial establishment, preferably in cement plants

LANGUAGE English

BACKGROUND INFORMATION The development of Infrastructure, Industry, Housing and Agriculture depends heavily on the availability of Portland Cement. Fortunately, the country has all basic raw materials within its borders, which are required for production of this commodity.

Industrial production of cement started in 1934 and other cement plants followed after 1945.

The most recent and still on-going development of the cement industry started in 1968/69 with projections for future demands and negotiations with foreign consultants and suppliers for geological, chemical and technical studies for new cement plants together with studies for the expansion of some of the existing plants.

The Government policy in the field of cement is to make the country independent of cement imports and to satisfy all cement requirements, through local production, for the development of Infrastructure, Industry, Housing and Agriculture.

NO CANDIDATES REQUIRED AT THIS TIME

A N N E X NR, 3

Damascus, 18 February 1981.

First periodic roport

on

A MISSION TO S.A.R.

for

THE GENERAL ORGANIZATION FOR CEMENT AND BUILDING MATERIALS INDUSTRY

by

Sigmund Abaffy

UNIDO expert

(DP/SYR/80/001)

This report has not been cleared with the Syrian Authorities nor with UNIDO or UNDP officials which does not therefore necessarily share the views expressed.

1. INTRODUCTION

Mr. Salem, SIDFA, introduced me to the UNDP Resident Representative, Mr. Khaled Yassir, to his deputy Mr. Robert Thompson, to Mr. Kassab Programme Officer who all were very helpful and gave a through orientation about the project's objectives. Later we payed a visit to the Director General of the General Organization for Cement and Building Materials Industry, Mr. A. Khalifeh where we met Mr. Haj Issa director of the productivity department.

2. OFFICE LOCATION

It was decided which room will be used by the experts in the Organization's building. It was stressed that most of the time will be spent in the factories. Already in the Adra Cement plant rooms have been allocated.

3. TRANSPORTATION

Due to the fact that I imported my private car no transportation problem can exist. I shall use my private car for all official travel together with my counterpart.

4. COUNTERPART

The Director General introduced his colleague, Mr. Faruk Awwad, as my counterpart. He is all time with me.

5. THE MISSION

My job description is as follows:

1) Establish programmes for maintenance and general overhauling;

2) Inspect the equipments, ensure proper operation and rectify any eventual anomalies or disorders;
3) Supervise maintenance and repairs and give technical advice for the rationalisation of maintenance procedures;
4) Supervise the erection of new installations, study loads for new machinery and equipment and plan the power supply;
5) Study the modifications required to be carried out on the electrical equipment and participate in their execution in accordance with approved schedules;
6) Supervise the workshops in order to accomplish the required maintenance and production services;
7) Prepare lists of spare parts and materials required for maintenance, point out the minimum and ordering stocks and maintain records of maintenance particulars and consumption of spare parts;
8) Establish economical standards for maintenance and workshop requirements and rationalise the application thereof;
9) Evaluate offers from a technical and econimic point of view;
10) Revise the electrical power consumption;
11) Take necessary measures for industrial security to ensure the safe operation of machinery;
12) Organise training programmes for the training of personnel whether through training seminars or on-the-job training;
13) Report on the maintenance and workshop activities.

6.WORK PROGRAMME

According to the Director General the assistance should be given

first to the Adra Cement Plant which is 40 km. from Damacus and later to the other ones. A team of two electrical and two mechanical engineers will be attached to me.

Mr. Takla, Director General of the Adra Plant,

Mr. Kosa, Technical Director of the plant and his colleagues

Mr. Sam-sam, Chief to the electric and Mr. Hiami Chief of the mechanis department, the expert and his counterpart were present when we discussed our programme:

1) selecting the engineers for the team
2) solving the urgent problems, which are:
   a) very high electrical energy consumption c:a 185 kWh/t. cement;
   b) frequent shut downs for repairs due to the lack of preventive maintenance as a) dusty and improperly cleaned work environment;
      B) infrequent and insufficient equipment inspection;
      C) the scarcity of skilled labour;
      D) drawings and technical datas are not brought up to date;
      E) no cards for each equipment to show its history, repairs carried out and number of spare parts available at any given time.

Mr. Takla requested that the expert should give written notice every day about his observations.

Hopefully the team will be assigned in the following days. 7. COMMENTS

The electrical and mechanical maintenance should be carried out simultaneously.

The principles expressed in the manuals of the supplier which contain recommendation for preventive maintenance will be carefully considered and should be translated to Arabic.

The expert should visit the plant even at night together with his counterpart. We already payed a visit on the 9 February between 23 and 3 o'clook.

The team should not be overburdened with daily repair work that no time will be available for systematical inspection of the whole factory.
Dust and other material comming from leaks HARM the equipment (6 kV motors for the cement mills) should be eliminated.
Cleaning the equipments and of the environment surrounding the equipment should systematically undertaken.
The maintenance of all earth moving, heavy transport and material equipment and the Company's cars are not included in our programme.
The CENTRE's (Industrial Testing, Research and Development Centre) facilities should be used extensively for all kind of repair. Its resources should be applied for training, for repair and calibration work.

The Cement Industries' required objective to manufacture cement most economically. It can not be achieved by changing constantly

the needed consultants which were and are assigned for very short periods but only with long term systematic guidance. Therefore it is strongly recommended that a Tripartite (the Government, UNDP and UNIDO) Review should take place soonest to define the real needs of the Syrian Cement Indurstry.

8.RECOMMENDATION

It is recommended:

to increase the production of the Raw Mill, doing so lower specific power consumption could be achieved;

to increase the production of the Cement Mills to improve the grindability of the clinker and therefore lower specific power consumption could be obtained;

to interconnect the two of three 20 MVA, 66/6 kV transformers;

to purchase urgently at least 8 battery units of 108 Ah, 120 V together with oharging units. The present ones are very near to collapse. They served their life, 4 years. Ni-Ka batteries are preferable.

Study Yours and Fellowhips are strongly recommended to Ankara, not only for the Cement Corparation's staff but for the cadres of the CENTRE too.

Technical Cooperation between the Republic of Turkey and the Syrian Arab Republic is at hand in this field.

ANNEX NR. 4

DAMASCUS: 18 th JULY, 1981

SECOND PERIODIC REPORT

ON

A MISSION TO S.A.R.

FOR

THE GENERAL ORGANIZATION FOR CEMENT AND BUILDING MATERIALS

BY

SIGMUND ABAFFY

UNIDO EXPERT

(DP/SYR/80/001)

This report has not been cleared with the Syrian Authorities nor with UNIDO or UNDP Officials which does not therefore necessarily share the views required.

1) The studies show that the Adra Plant equipment is poorly maintained, and that Plant repair rates are very high.

2) Reasons for these conditions are dusty and improperly cleaned work environment, infrequent and insufficient equipment inspection, the scarcity of skilled labour and the linguistic barriers faced by.non-Arabic speaking, foreign labour (Ermans, Bulgarians, Indians etc.).

3) Preventive maintenace guidelines are extremly well described in the so called AMKs (Supplier instructions).
Unfortunately they are available only in English.

4) We are preparing a set of check lists for one of the production lines of the Plant. The check Lists are a first step toward the establishment of preventive maintenance schedules.

5) It is recommended strongly that equipment inspection and environment cleaning be given priority in preventive maintenance planning. It is further recommended that a general production overhaul be undertaken and that preventive maintenance training be instituded.

6) The fact that almost all engineers work only on the morning shifts in a Plant which works 24 hours gives the answer why most of the breackdowns occur during nights.

7) The electrical and mechanical workshops are quite well equipped.

8) Mechanical and electrical drawings and documentations have been delivered by the supplier, but they are "scarce commodities". So for the expert could not find out who is responsible for them and who has all of them, probably nobody.

9) Due to this sad circumstance the spare part inventory and demand for new spare parts is in a dangerous shape.

10) It has to be mentioned that needed spare parts often are taken from completely new units causing big damages. (After one part, small or big, of the new machinery is once removed and never replaced the so called "new" machinery is useless.).

PLANT INSPECTION

In general, production line equipment and auxiliary section equipment is not inspected efficiently by either the production or the maintenance services.

Production operators, who run the production sections from central panels, rely on the remote control devices of the panels and do not systematically inspect the production units and the equipment performance. On the other hand, maintenace teams, who are overburdened with daily repair work, have not time left to systematiclly inspect the equipment.

As a result, production sections stop because of equipment malfunction or breakdowns and the maintenance services are then even more overburdened with repair jobs.

In fact, most equipment malfunction or breakdown is not and cannot be indicated in the sections' central panels. Thus raw material wastage, piping leaks, loose foundation bolts, equipment overheating, noise and vibration are only revealed after breakdown of the equipment or production unit stoppage. Furthermore, a general annual examination of the production line or overhaul with complete investigation of the state of equipment is not carried out in the plant. Thus small equipment defects which can only be revealed by thorough inspection during overhaul remain unnoticed till they cause serious damage and production unit stoppage.

Moreover, cleaning the equipment and of the environment surrounding the equipment is not systematically undertaken by the plant. Dust and other material coming from leaks harms the equipment and makes inspections difficult or even impossible.

MAINTENANCE OF MACHINERY AND EQUIPMENT

The procedure of preventive maintenance is one of the most important operations in the cement works. The efficiency of the machinery and equipment and productivity depend mainly on the sufficiency of maintenance activities as well as the correctness of operational processes.

The process personnel must take care of cleanliness of all parts of production units to maintain the proper environment for efiective maintenance. The maintenance and lubrication personnel may not be able to perform their task satisfactorily if they are confronted by inconvenienses such as dusty channels, blocked passages, and bearings and gears contaminated with dust.

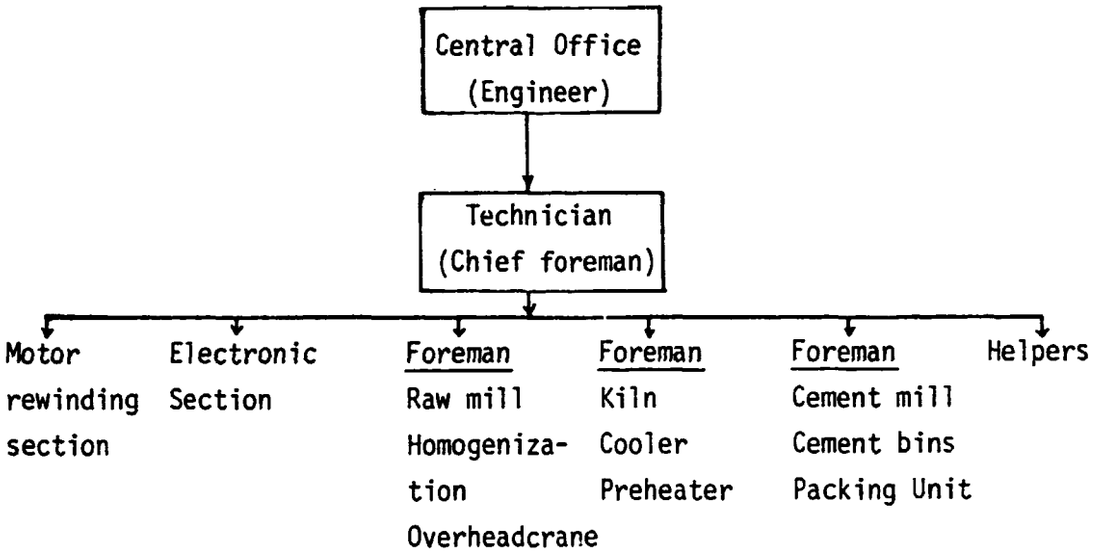
The operational personnel cannot attain optimum productivity if the preventive maintenance is not effectively organized and punctually performod. The task of cleaning may become impracticable with flowing chutes because of exeessive wear of the steel lining, dusty handling if the filters do not funtion properly, an accumulation of stagnant dust blocking the horizontal dedusting pipes, and eventual leakage from various conveyors. The production and maintenance processes are interrelated. A fruitful step has been to have the maintenance and operational instructions manuals of the main machine suppliers translated into Arabic for training activities. Preventive maintenance particulars should be tabulated in a simplified comprehensive schedule. It is also recommended that specified groups of maintenance personnel be assigned for every group of machinery with well defined responsibilities for timing of periodic inspection, revision cheeking, routine maintenance and general overhauling with special reference to man hours per operation and average lifetime of wearing parts.

For example, one of the mills and related conveyors should be stopped for inspection and maintenance one day a week in order to cover the whole group of mills and their accessories consenutively in a week. This would assure more intensive maintenance than performing the maintenance of all mils in one day, which might occupy all personnel and still not cover emergency cases in other production sections.

The existing production lines have not been in operation very long; they has to be considered as good as new. But shortly various mechanical and electrical invonveniences will occur as a result of the usual wear and tear encountered in normal practice as machines age. New sorts of serious difficulties may occur if protective maintenance is not kept up to the best technological standards.

1- The following should be carried urgently:

a) Reorganization of the maintenance unit (Electrical)



Duties

Central office (Engineer) : Programming of preventive maintenance to prepare- How to do-lists

Check-lists

Trouble shooting lists

Job quality control (JQC) lists

To prepare and give job orders

Job order evaluation

Stock control

Tabulating the timing

Preparing the training programmes and to evaluate them

Technician (Chief foreman)	Supervision
	Jop quality control
	Lost time control
	To distribute the job orders to foremen
	To give enough helper to each foreman
	for the job to be done
	To follow the achievement of the training
	programs of each helper
Foreman	: Responsible to do the jobs as described in "how to do lists"
	To lead his helpers to achieve the job within the given time
	To train a helper at time (as a tutor)
	Expected to do the jobs given in Push 1, 2, 3
Helper	: Expected to do the jobs given in Push 1
Electronic section	: To repair the measuring and control instruments
	To calibrate automatic weighfeeders/Co $+0_2$ transducers.
Motor rewinding section	: To rewind the burned, damaged electrical motors.

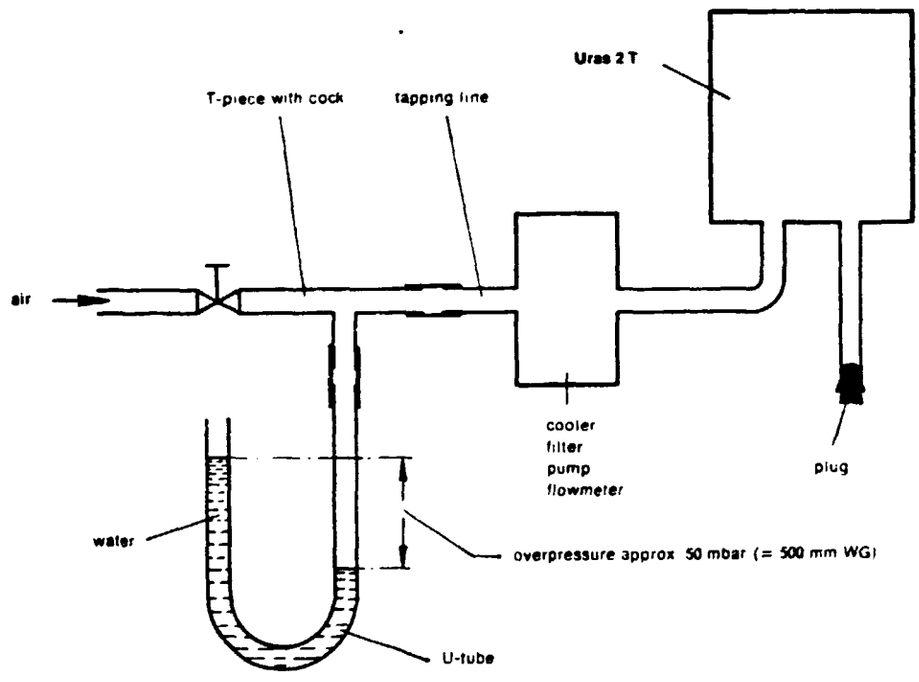
The foreman responsible from kiln, raw mill, cement mill do their routine jobs according to the given job orders. Each foreman is responsible to work at any unit especially in case when there is an urgent call.
After completing the job, the foreman informs the technician in order to let him to evaluate the job.
Every foreman responsible from a certain unit should havea ready tool - box and avometer.

3- How to test the break-down voltage of a transformer or circuit breaker oil

4- How to test the functioning of a switching board.

5- How to calibrate an oxygen transducer

How to do list for the air leakage test of a gas sampling system.



1- Close the gas outlet nipple of CO transducer

2- Disconnect tapping line directly at the gas tapping point.

3- A T-piece with cock is connected as shown in figure.

4- Connect one end of the T-piece to a U-tube manometer filled half with water.

5- Blow in air through the cock until the entire installation is subjected to an overpressure of approximately 50 mbar.

6- Close the cock

7- Wait one minute. Water level in the U-tube should not change markedly

8- If pressure drops, there is a leak somewhere.

9- Test the individual components by the same method described above.

b) Supervision

The chief foreman makes a job quality control (JQC) after a job has been completed.

If the time necessary complete the job is exceeded a lost time report is prepared listing the reasons of completing the job late.

The JQC and lost time reports together with the finished job order reports are given to central office.

The engineer can control everystep of any job.

c) How to do lists

These lists are to be prepared from supplier catalogues and are to be put inside the plastic folders. When a job order is given this folder is to be taken to the job site together with.

How to do lists must be prepared in a very simple form and every step must be practical and easy to understand.

Drawings and pictures should be included when necessory

How to do lists can be prepared about the following subjects

1- How to mount, dismount and align a certain mechanical, electrical part

2- How to test the insulation resistance of on electrical motor.

d) Training

Objective To train and develop a helper into a foreman within a certain time by PUSH programs.

PUSH 1 is minimum 1 year-to become a junior helper

PUSH 2 " " 1 " " " " senior "

PUSH 3 " " 1 " " " " a foreman

Therefore in minimum three years time a plain electrician will be a foreman electrician and will be able to deal with all type of problems occuring in the cement plants.

First of all the helper will start fo follow PUSH 1 and when he completes all the steps of PUSH 1 and learns everything in detail he will be allowed to pass PUSH 2.

The level of knowledge of the helper about his training will be continuously followed by his tutor. A helper will be allowed to pass to a higher level of PUSH program when his tutor agrees and signs the paper showing that the helper has completed everything in detail.

A tutor must accept that the training of a helper is a very important step in solving the problems and should never underestimate its importance A helper who finishes one of the PUSH levels may be examined by technician or an engineer.

PUSH 1

VISA SHOP SITE VISA

1) To use AVO meter, wheatstone bridge and motor insulation tester
2) To check whether the motor is burned
3) To change fuses of power and control networks
4) To start all type of motors
5) To know the exact places of switching boards, motors electrical devices by heart
6) To know the places of the push buttons, contactors, circuit breakers, fuses of the important machines
7) Tolearn the operation principle of cement works
8) To know which tools must be presentin the tool box
9) To prepare a specified job (unsupervised)
10) To change the circuit breakers, contactors
11) To check the carbon brushes of the electrical motors and to change them
12) To reset the thermic relays and to change them
13) To install a motor and realign it
14) To prepare the carbon brushes of overhead cranes
15) To clean the switching boards

PUSH 2

VISA SHOP SITE VISA

1) To readsand understand the electrical circuit projects
2) To test the insulation resistance of the motors and transformers
3) To know how to maintain the battery groubs
4) To know what to do when electrical energy shutdown happens
5) To maintain the electrical motor starters and to troubleshoot and rewind them
6) To know how to troubleshoot the control circuitry of all the units within the cement plant (i.e. Raw mill, kiln, cement mill, cooler etc.)
7) To maintain circuit breakers, to adjust the legs of circuit breakers
8) To test the insulation oil in the transformers
9) To know all safety precautions against high voltage.
10) To clean the bushings of the transformers, to change the silicagel, to check the oil level in transformers
11) To understand the importance of all the process control instruments in the plant

PUSH 3

VISA SHOP SITE VISA

1) Calibrate CO/O_2 transducers and troubleshoot them
2) To test gas sampling system to gas analysis devices
3) To calibrate automatic weighfeeders mechanically and electrically and to test them
4) To know the operation principles of thermocouple, thermoresistance, radiation pyrometer, tachometers
5) To know the importance of wheatstone bridge circuitry in process instrumentation
6) To calibrate the temperature measurement circuit and to troubleshoot
7) To calibrate the pressure and flow measurement circuitry
8) To calibrate the damper position measurement circuitry
9) To make functional tests of indicators, recorders and controllers
10) To know the temperature, pressure, flow speed measurement points at kiln, cooler, preheater mills etc. and also to know the values of the measured quantity at that point by heart
11) To make the functional tests of the switching networks in detail
12) To be able to troubleshoot all electrical networks in the plant (i.e measuring circuits, control circuits, protection circuits etc.)
13) To be able to trouble shoot all electrical networks in the plant (i.e. measuring circuits, control circuits, protection circuits etc.)

FOR ALL PUSH (1 +2 +3)

VISA SHOP SITE VISA

1) SAFETY ATTITUDE

2) PERSONAL APPEARANCE

3) ATTITUDE

4) EFFICIENCY OF OPERATIONS

5) ABILITY TO SOLVE PROBLEM

6) MANUAL SKILLS

7) LEADERSHIP

8) COMMUNICATION WITH SUPERVISORS

9) APPEARANCE OF EQUIPMENT

10) SELF TRAINING

11) CAPABILITY TO WORK ALONE

12) ABILITY TO WORK UNDER PRESSURE

13) CREATIVITY

Ready Tool Box

e)
Tool box must contain the below tools.

1- Light hammer
2- 1 lb. hammer
3- Hacksaw blades
4- Wire brush
5- Set of screwdrivers
6- Set of long punches
7- Fibre (or rubber)hammer
8- Hacksaw
9- Set of files
10- Set of short punches
11- Set of combination spanners
12- Set allan keys
13- 6 adjustable wrench
14- 10" adjustable wrench
15- Large screwdriver
16- 10" adjustable pipe wrench
17- Electrician pliers
18- Adjustable pliers
19- Circlips pliers straight jaws
20- Circlips pliers bent jaws
21- Measuring tape
22- Set of philips screwdrivers
23- Vise grip pliers
24- Side cutter
25- Wire stripper
26- Bend nose pliers
27- Long nose pliers
28- Cutting pliers
29- Scoth tape
30- Sand paper
31- AVO meter
32- Fuses
33- Bolt and nuts
34- Screws

A proposal for the solution of some urgent problems

A- Gas analysis transducers

These transducers are not operating well due to the fact that

a) The gas sampling probe placed at the kiln inlet is bending due to the high temperature (about $900^{o}C$) at that point when the cooling water has not enough pressure (about 2.2 kg/cm^2)

b) Sometimes raw meal is clogging the gas entrance (inlet) point

c) The pipe connections between the probe and CO/O_2 transducers leaking. In such a case the oxygen content in the kiln atmesphere is shown at a higher value where as carbon monoxyde is much more less than in reality

d) The calibration of CO/O_2 transducers are not done periodically

e) Shortage of spare parts

f) Necessity to well trained personnel

Solution

a) At each shift, a production personnel should be responsible to maintain the gas sampling probe

i. The pressure of cooling water must not be less than 2.2 kg/cm^2

ii. Probe must be drawn from the kiln inlet to check whether it is clogged

b) The measuring installation should be checked daily by the electrical maintenance people i.e

i. make an air leakage test

ii. calibrate CO/O_2 transducers

iii. Drain the condensation water

B- To reduce electrical motor damages

In order to reduce electrical motors to burn out

i. At every 6 months the insulation resistance of the electrical motor should be checked and recorded to the motor history cards. By this way the trend of the insulation resistance curve will give a clear idea about the motor life

ii. The alignment of the motor should be done in such a way that the level of vibration is at minimum

iii. The noise, vibration, temperature of motors should be controlled periodically

C- The automatic weighfeeders

These can not be operated well because of the fact that

i. Misalignment of the mechanical unit

ii. Miscalibration of the electronic unit

iii. Due to very dirty and dusty circumstances

Solution

i. Enough personnel should be trained to align and calibrate the weighfeeders

ii. Weighfeeder will never be started at its high capacity

iii. The dust on the load cell, belt, roller will be cleaned daily

iv. A known person should be responsible from the alignment and calibration of the weighfeeder.

3- Systematization of the procedure for ordering spare parts. starting with the identification of average lifetime for each wearing part and, consequently, the recommended minimum stock;

Solution

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3- Systematization of the procedure for ordering spare parts. starting with the identification of average lifetime for each wearing part and, consequently, the recommended minimum stock;

4) Revision of kiln alignment and consequent readjustmant of roller supports if necessary. In this connection the life ring of the outlet of kiln II seems to exert abnormal stresses, indicated by symptoms of stripping off of the lateral holding pieces of the life ring;

5) Inspection of gearing systems with subsequent rectification of meshing, turring or substitution of any gear or pinion if required.

SUPPLIES OF SPARE PARTS·

Spare parts reserves should be sufficient to secure the proper functioning of machinery and equipment.
A missing spare parts can easily cause a standstill in production.
With the progressive aging of old production lines, more parts will show symptoms of wear and will break down more frequently than during the guarantce period. The spare parts supply should be rationalized through systematic procedure of ordering in accordance with minimum stocks data.
A considerable offort has been made to register minimum and ordering stocks on stock cards in the main stores. But owing to the shortage of reliable information about the main features of wearing parts in terms of average lifetime and probable eventualities these figures of minimum and ordering stocks, should be revised from time to time according to practice and the advice of machine suppliers.

The system of spare parts should not be subject to hazard or depend on the care of someone whose memury may not be entirely reliable. It would be advisable to make a general order at the beginning of each calendar year. This operation would profit from reference to the general inventory which is normally performed by a reliable committee at the years's end. Another phase of ordering on a smaller scale may follow during the year if excessive application reduces a a particular item to the ordering stock.

The storekeeper would then notify the technical person concerned who would investigate the reasons for the additional requirement and readjust according to practical experience and special working conditions. The rectified quantities would then be passed to the purchase department for quotations and the issue of official orders in time. In case the stock figure attains the minimum or critical stock, special emergeney measures would have to be taken to speed up procurement.

It is advisable to keep up a stock of two years consumption of imported spare parts, taking into consideration the time necessary for: submission of the requisition; exchange of correspondence; working out cf quotation; evaluatino and issuc of official order with credit opening: delivery time of 6-12 months; and packing, shipment and clearence from customs.

A precise regtster shouldbe kept in the main stores, including the life history of each operation in the forms of follow ip from the first purchase request through stages of technical revision, submission of requisition or tender, procurement of quotations, evaluation and approvel, opening of credit, issue of the official order, confirmation of suppliers, delivery and shipment, arrival to local port, customs clearance of consignment, to reception with revision and quality control and ultimalety classification in the proper bin. Bach step should be clearly marked out with data and reference number, and delays should be made up in time. This procedure would iminate the risk of surprises with missing spare parts and would also avoid blockage of the purchase procedure at any of the import stages.

ORGANIZATION DE REFILLING MILLS:

Adequate messures must be taken to keep the recommended optimum charges of grinding media in the raw and cement mills. A discrepancy in the mill charge leads to reduced output owing to lack of grinding power. Moreover, it makes for excessive wear on the lining plates and grinding bodies because of the increased fall of steel balls instcad of the designed cascading motion.

The cade study of raw mill No. II is an examplification on checking procedure. Inspection of the mill showed a lower charge level.

The lining plates showed symptoms of excessive wear.

As a consequence, the classifying action of lining plates was reduced to some extent, and the steel balls were evidently segregated. Steel balls of the largest diameters are concentrated along the first five rows of lining plates in the second compartment right after the diaphragm. This position consequently shows heavy wear, which is aggrevated by a peculiar phenomenon of breakage of lining plates. In this connexion it would be advisable to fill in the hollow back of the lining plates with asbestos cement mortar. It is recommended that profit be made of the next stoppag of kiln No. II to sort out steel balls of raw mill No.II, re-weigh the classified dimensions and fill up the mill with the recommended charge of grinding bodies. Refillings have to be regularly registered, Ultimately, from the interrelation between various data the average wear of grinding bodies. may be determined per ton production, and the average electrical power drop for the consumption of each ton of grinding media. After a few years' practice the final average figures an be applicd for further refillings; with the mill inspection the situation is revised and the refilling is performed accordingly:

a) The total output of the mill is added up since the previous filling, this production tonnage is then multiplied by the average figure for wear of grinding bodies per ton of ground material;

gm media wear/ton x tonnage production = required charge milling;

b) The total drop in the rated KW consumption of the mill proper (excluding accessories) is worked out in terms of tonnage of corresponding grinding media:

KW drop tonnage media per KW = required charge refilling.

The same result may also be obtained from the mill amperage which can be worked out according to the relation:

$$N = \frac{VA\ 1.732}{1\ 000}\ n \cos \phi \text{ (in KW)}$$

Where N = power of motor, V = voltage. A = Amperage, n = efficiency of motor (0.88-0.9), and cos ø = power factor,

c) The charge of steel balls is measured in each mill compartment, by measuring the empty section or by counting the circumferential rows of lining plates.

The volume of charge is then calculated according to the equation:

$$V = L \left(\frac{a}{180} r^2 \text{ II- } \frac{bh}{2} \right)$$

Where V = volume of charge, L = length of compartemnt, r = radius, b = breadth of charge, a = angle from central column and h = perpendicular distance to center.

The werght is worked out from the specific weight to be practically determined.

Guidelines for specific weight may be taken as:

Diameter of steel balls (mm)	30	40	50	60	70	80
Specific weight of bulk	4,900	4,740	4,600	4.560	4,490	4,400

The weight of actual charge is related to recommended charge, and the deficit is concluded by the difference.

Ultimately, the three aformentioned alternatives are combined for attaining the most relaiable conclusion, according to which the refilling is accomplished up to the optimum charge. The latter is calculated according to percentage loading, to be multiplied by the clear cross sectional area-arimum^{2}ux bengtht of the mill, or specificlcompartment in metros x bulk density of grinding media in kg/m^3.

This procedure simplifies the refilling operation without need for freouent re-weighing. A general revision may thus be sufficient once every year for rectifying any accumulated crrar and sorting out deformed, split and worn out grinding bodies. The aformentioned registeration system systemationes the refilling proceedings, allows an evaluation to be made of the qualities of various makes of grinding media, and ensures ample ordering of yearly requirements according to the scheduled production.

CONCLUSION

The aim of the plant is to produce as much cement of acceptable standard as possible; to do so on a regular basis, and at minimum cost. To attain this goal, the production sections and the services of the plant must

adjust their programmes and organize their activites accordingly. The aim of the electrical and mechanical maintenance service is to keep the plant equipment in good condition and working regularly, so as to perform its designed tasks, and to prevent costly repairs. The service can reach this aim by organizing and implementing appropriate preventive maintenance planning.

The preventive maintenance service of the plant must perform regular, periodic and systematic inspections and keep records of the state of plant equipment.
The following five specific tasks must be accomplished in order to satisfactorily perform preventive maintenance:

a) The determination of whether mechanical or electrical equipment is to meet standards set by the supplier and/or standards of general engineering rules.

b) The repair of equipment failure and damage as soon as it occurs;

c) The programming of systematic and periodic equipment servicing and overhauls;

d) The establishment of spare part requirements;

e) The study of continuing improvements within the plant.

The implementation of preventive maintenance should be done by a central office which has engineers, foreman, draughtsmen and clerks who would perform registry and administrative tasks. Teams of checkers of inspectors consisting of foremen and trained fitters perferming inspections within the plant would supplement the central office.

The main tasks of the central office would be:

a) To prepare from supplier instructions or mechanical engineering general rules weekly department check-lists equipment standstill check-lists, and an equipment periodic check-list;

b) To evaluate checked lists and then issue job orders, interservice notes and new periodic check-lists;

c) To evaluate performed job orders and then register performed jobs in the Life card of equipment, issue interservice notes and issuc new periodic check-lists

d) To file all issued periodic cards in periodic card timing files, in periodic card item files and in periodic card issue date files;

e) To schedule daily checks from periodic time files and standstill checks from equipment files and to issue job orders and interservice notes;

f) To prepare overhauls and spare part requirement programmes from equipment life cards and from standstill files.

The expert needs decision from the General Manager, willingness from colleagues and time to be able to assist the Organization in carrying out the important tasks.

The expert would greately appreciate if the Syrian Authorities, UNDP and UNIDO will agree when he can take his annual leave. He would very much prefer the date between 11 Septembre and 15 th October 1981, and he really hopes it will be granted.

ANNEX NR. 5

After this a thorogh cleaning of all bearings and rollers should be carried out. A complete realignment of the whole kiln shall be planned. Some of the rollers have suffered damage beyond repair. They would be replaced. Others will have to be machined (resurfaced).
A lathe for this kind of work should be available.
Finally, the expert pointed out to the staff of Mussulmieh certain minor details regarding routine inspections of the roller bearings to secure that they are working correct as to carrying the horizontal forces from the kiln. He was informed that the supplier of the kiln has been asked for comments.

It is recommended that two Syrian mechanical engineers should be prepared for the special job of checking existing kilns in Syria and for the work of adjusting such kilns.

A STUDY TOUR should take place to any of the well-known cement making machinery (kilns) company. It would be a great value to the engineers receiving the theoritical knowledge of the way of recalculation of all the main measurements regarding to the rollers. Any change of roller dimensions will change all main distances from kiln-centerline to roller-centerline.

Also they should be given a chance to study the methods of checking kiln performance by the "lead thread" method and the use of the

"shell test" methode (ovality). Any conscious responsible kiln manufacturer should be interested in such "fellowship" thereby guaranting correct handling of the equipment.

It was discussed the protection degree of the 6 kV motors. Today all motors are IP 23. IP 44 is not recommended but the machine roomsshould be properly closed to avoid dust.

The damaged 225 kW motor should be repaired soonest. The best would be if AEG in Istanbul could carry out the repair.