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ECONOMIC AND SOCIAL COUNCIL

ECONOMIC AND SOCIAL COMMISSION FOR WESTERN ASIA

Industry Division

MISSION REPORT
ON
ASSISTANCE TO EXISTING INDUSTRIES

General Industrial Corporation
Abu Dhabi, UAE

By

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Regional Adviser

* The opinions expressed in this report are those of the author and do not necessarily reflect those of the United Nations Economic and Social Commission for Western Asia.

87-1098

CONTENT

BACKGROUND

The Joint ESCWA/UNIDO Industry Division has formulated a new project on "Assistance to Existing Industries". The project is aimed at extending assistance to industrial establishments in the region to overcome managerial, commercial and technical problems in order to ensure the efficient and normal operation of these industries.

According to the project document, such assistance is provided in three stages, namely:

1. Diagnostic stage: to assess the extent and magnitude of problems and identify causes.

2. Solution stage: to recommend solutions to the problems identified.

3. Implementation stage: to implement recommendations, plan of action and follow-up.

ESCWA carries out, and finances, the first two stages while the industry concerned is responsible for, and finances, the third stage.

The General Industrial Corporation (GIC) of Abu Dhabi, United Arab Emirates, requested ESCWA to provide assistance to six industrial establishments which operate under its supervision (annex I). These establishments are: Al-Ain Cement Plant, Al-Ain Concrete Block Plant, Al-Wathba Concrete Block Plant, Abu Dhabi Flour and Animal Feed Plant (the flour plant and the animal feed plant being under one management) and Abu Dhabi Bag plant.

The assistance requested by GIC covered two areas:

1. Preventive maintenance; to review and set up procedures for all six plants.

2. Spare parts inventory control in Al Ain Cement Plant; to assess and set up an appropriate inventory control system.

The Joint ESCWA/UNIDO Industry Division assigned the Regional Adviser, Najim K. Kassab, to attend to the request of GIC within the context of the above-mentioned project.

As a first stage, a mission was undertaken by the Regional Adviser, to Abu Dhabi during the period 1-11 June 1987, to assess the extent and magnitude of problems and identify their causes. Prior to the mission, a set of questionnaires was prepared by the Regional Adviser as a guideline for discussions with the maintenance staff of these plants.

A preliminary meeting was held with the Director of Planning and Implementation of GIC, Dr. Mowafak Arif Zahr. In this meeting, the terms of reference of the Regional Adviser were reviewed and agreed upon. Arrangements were also made to visit the plants.

All six plants were visited. Discussions were conducted with the staff directly involved in maintenance activities. The questionnaires which were prepared by the adviser were used as a base for discussions. These covered almost all aspects of maintenance as related to organization, system in use, costing, spare parts, documentation, workshop facilities and others. Information related to each plant is recorded in annex III.

A brief Back -to-Office report was submitted upon the completion of the mission (annex II) wherein it was pointed out that another report will be prepared incorporating the findings and recommendations of the adviser.

This report, as enclosed, consists of three parts:

Part I covers a general discussion on maintenance function, elements of maintenance planning and some support services required for implementing proper maintenance.

Part II analyses the situation in each plant visited based on the observations made during the field visit and the data obtained as recorded in annex III.

Part III covers the conclusions and recommendations.

I. Maintenance, Function, Planning and Prerequisites

1. Maintenance Function: The aim of the maintenance function is to ensure the maximum availability of production equipment and utilities at an optimal cost.

From this point of view, the role of maintenance involves more than simply dealing with emergencies or making repairs. The maintenance function is a productive function and it is necessary to pay the same attention to it as to the operating function. Maintenance contributes not only towards ensuring a continuity of production, constant quality level and minimal production cost, but deals equally with the conservation of equipment.

In order to attain these objectives, maintenance is dealt with in practice in various ways which are:

Breakdown maintenance: This approach is also referred to as "repair" maintenance, but is not in the true sense a system at all. No service is carried out unless a failure has occurred. Sometimes no maintenance men are on call. Machine operators often repair the machines that they themselves use. No effort is made to find out the reasons for the breakdowns.

It was believed that this type of maintenance is more economical if the equipment is operated until the parts actually fail, in which case the parts are utilized to the maximum possible lifespan. This can be the right concept when sudden failure of one piece of equipment does not affect other parts of the factory, or has no harmful consequences, or will not complicate the repair work later or will not influence the production process.

Preventive maintenance: It consists of examining and working on the equipment at predetermined intervals in order to detect and prevent damage to the machine, or premature wear before breakdown. The most important preventive maintenance work consist of: inspection (including dismantling), cleaning, testing, adjustment, replacement and lubrication.

For example, this entails:

- Feeling the temperature of all bearing points and other sensitive parts of the machine and identifying abnormalities;
- Inspecting the machine for excessive noise and vibration, reading all measuring instruments and dials;
- Tightening all screws and nuts;
- Cleaning the machine and surroundings to be able to detect any oil leakage;
- Adjusting the levels of oil to the optimum level;
- Lubricating all bearing points with the right quality of lubricant;

- The planning of these activities, i.e., maintenance planning, entails a fully detailed review of the operation to be carried out, including its frequency and the time required for each operation.

Plant improvement maintenance: This involves the improvement of the equipment in order to ensure the following:

- Increase maintenance ability;
- Ease operation;
- Improve quality and quantity of final product;
- Ensure safety of personnel.

2. Maintenance planning; This embraces all activities necessary to plan, control and record all work done to keep an installation at the acceptable standard.

The elements in a planned maintenance system are:

(a) Facility register: The first step in introducing maintenance planning is to compile a comprehensive facility register, i.e., an inventory of all plant and equipment on which maintenance is to be carried out. This is to be extracted from technical documents and specifications. For purposes of simplification, a card index system is set up. Each card must positively identify the items to which it refers, giving reference number, particulars of the manufacturers, the functional name of the item and its location. A typical card is shown in figure 1.

The register is to be subdivided. It is also suggested that it should be classified according to usage, i.e., section by section.

Furthermore, such divisions of the register may include separation of electric motors, gear boxes, pumps, pressure vessels.

The facility register is the very heart of the planned maintenance system. The type of information placed on the cards will depend on the requirements of the system adopted for the particular plant under consideration.

(b) Maintenance schedules: After the facility register has been compiled, comprehensive maintenance schedules, listing the requirements of each item shown on the facility register, in so far as maintenance is concerned, have to be prepared.

Figure 2 is a typical schedule card that indicates the periodicity of the work to be done, details of work and the estimated time.

Basic data can often be obtained from manufacturers manuals, but not all have the necessary information; therefore additional information, based on local requirements, should be provided.

During the course of preparation schedules, it is important to know and decide on:

- which of the preventive maintenance tasks can be carried out with the machine running and which will require a shut down and for how long.

- which spares will be required for a particular situation, so that these can be made available.

- what the lubrication requirements are. These are usually specified and scheduled separately.

(c) Maintenance record: the record system should be developed in such a manner to ensure the recording of useful and comprehensive information with minimal clerical work required

Recording helps in studying the behaviour of equipment and the effect of improvement and frequency of preventive maintenance and planned repair, proper planning of spares and analysing the past performance of the equipment, i.e.,

- Any failure that takes place and how it was set right.
- Repairs and overhandling jobs done.
- Any other major work.

Figure 3 is a typical card for direct issue to maintenance staff to be signed on completion of task.

Figure 4 is a typical simple history card in which emphasis is on defect analysis and columns are provided for recording maintenance times and total downtime.

To obtain maximum value from these cards, it is essential that they be filled out regularly and reviewed periodically by the maintenance team.

(d) Maintenance control system: A well-functioning maintenance system requires an effective control system, the purpose of which is to trigger the necessary maintenance activities at the required time.

Control methods used are:

- Card index systems;
- Manual or automatic sorting/printing machines;
- Computer programmes.

The guide to the selection of a control system is in the number of the maintenance activities to be scheduled.

Normally the card index system is used where the number of activities does not exceed 5,000. Above this number either automatic sorting or, more preferably, computer programmes are used.

The term maintenance activities refers to the items on the maintenance schedule and not to the plant items. Thus a machine with two sections, each requiring both weekly and monthly attention produces four activities.

3. Lubrication: Efficient lubrication is a fundamental element of preventive maintenance. Full and detail recorded information is necessary for carrying out the lubrication activities. This information concerns the work specifications and the lubricating points as well as the planning and the inspection of the work.

A distinction should be made between the following elements:

- Work instructions: the lubrication card;
- Lubrication planning;
- Lubrication workload schedule.

The lubrication card contains a scheme or a photograph of the subsassembly on the machine. The following informations should also appear on the card:

- The machine;
- The subassembly;
- The lubrication points;
- The type of work;
- The frequency;
- The lubricant which should be used.

The lubrication plan is made for those lubrication activities occurring more often than every two weeks. The lubrication plan is based on the one hand on the lubrication programme and on the other hand on the planning of preventive maintenance. Due to the fact that most of the lubrication activities with a frequency exceeding one month coincide with those of preventive maintenance, lubrication planning is included in the preventive maintenance plan.

4. Documentation: One of the prerequisites of good maintenance is the availability of adequate technical documents.

The objective of technical documentation could be summarized as:

- Making possible the preparation of the preventive maintenance programme;

- Preparing the lubrication programme;

- Efficient preparation of the maintenance activities;

- Set up of machine registry cards;

- Set up of maintenance planning;

- Reduction of time spent on maintenance activities in particular on trouble shooting;

- Facilitates assembling and disassembling;

- Improving safety;

- Adequate training of maintenance personnel;

- Making possible a sound selection of spare parts and consumables to be held in stock or to be manufactured locally;

- Allowing an adequate standardization of the spare parts.

In order to fulfil these objectives, the documents should contain the following:

- Mechanical drawings and general documents;

- Drawings, circuits and other documents regarding electrical and automatic control equipment;

- Drawings and documents regarding fluid circuits;

- Spare parts;

- Operating manuals;

- Service manuals for principal machines.

The service manuals should contain:

- General specifications;

- Instructions for assembling and disassembling;

- Instructions for adjustments such as adjusting brakes, clutches, transport belts, etc;

- Complete instructions for starting up, (adopted to the level of local personnel);

- Lubricating instructions, lubricating cards, lubricating planning, selection of lubricants, lubricating drawings;

- Information regarding preventive maintenance;

- For standard equipment such as compressors, the workshop manuals for periodic overhaul and the complete parts lists;

- List of possible breakdowns with their symptoms, consequences, and recommended action;

- For electrical and automatic control equipment, repair and trouble-shooting instructions, testing circuits, information regarding electric motors, transformers, etc;

- Checklists and test programmes;

- Lists of special tools;

- Lists of measuring instruments and control devices.

5. Inventory Control: Another prerequisite of maintenance management is to have the right quantity and quality of spares available when needed to avoid costly operating delays in production facilities and to achieve this objective with a minimum imvestment in spare parts. The specific objectives are:

- To carry in stock the minimum number of spares required to ensure the work of production and support facilities;

- To tag or otherwise mark spares for easy identification;

- To stock spares in an orderly and adequately protected manner in a minimum number of areas having controlled access;

- To locate the right spare promptly when needed;

- To identify and dispose of obsolete and surplus spares;

- To adopt and use a sound procedure for replenishing depleted stocks;

- To adopt and use a practical system for maintaining sparestock records

II. Analysis and Observations

The following is a brief account of observations on each of the plant visited. Full details on each plant are covered in annex III.

1. Al-Ain Cement Plant: The facility register in the form of card system is not available. Instead several notebooks are used, where the descriptions of certain equipment are registered. General inspection as a routine procedure as well as some repair work is registered for some equipment only. Monthly reports and log-books for major maintenance works are recorded on certain occasions. This means that the elements of a maintenance system have not been established, and the control system, which triggers the maintenance activities, is not in operation.

From the present limited records, it is difficult to obtain data on the type of maintenance carried out, whether planned or unplanned.

Work specifications, and maintenance schedules are not issued in advance. It is claimed that the maintenance team is experienced and quite acquainted with the job, and therefore it is not necessary to issue such schedules.

Similarly, work orders are not issued. It is claimed that this was done sometime ago but with some discouraging results, due to the additional clerical work required. Therefore orders are now communicated verbally.

Given such circumstances it is very difficult to assess the volume of maintenance and the number of maintenance activitiesy per year.

Although a yearly schedule for maintenance in the form of a bar chart is prepared, the implementation and follow-up is very weak because the maintenance team is heavily loaded with unplanned or repair maintenance. Although no record is kept, it appears that the percentage of unplanned maintenance is on the high side as compared to the planned one.

Maintenance costing for different type of maintenance activities is not practised.

The maintenance team, including workshop workers, numbers about 85 out of 447 (total at the plant). The functions and responsibility of the maintenance team are not defined. It is claimed that every team member knows his duties. During emergencies, workshop workers are recruited for maintenance work as well.

Most documents related to operation and maintenance are available in English and there is no difficulty in using these. Maintenance work and procedures are sometimes extracted from the instructions by engineers and given to maintenance workers for implementation.

Certain instructions for assembly and disassembly are not provided.

About 35,000 items of spare parts are stocked. These are tagged and distributed among several stores. Some of the items are slow moving. Inventory stock would be necessary in order to set up the minimum number of spares required to ensure uninterrupted operations of works production and support facilities, and to identify and dispose of obsolete and surplus spares. There is an apple computer and about 5,000 items have been fed into it but it is now out of order.

The workshop facilities provide most necessary work required for the maintenance, without calling on outside help except in certain special cases.

Measuring equipment for noise, vibration and crack detection is not used.

2. Al-Ain Concrete Block Plant: Some cards related to routine maintenance and inspection of equipment are in use. Simple schedules for overhauls are prepared.

As the plant is adjacent to Al-Ain Cement Plant, major maintenance work is carried out through the cement plant workshop. All the spare parts are stocked in the stores of cement plant as well.

Simple maintenance is carried out by the operators of the plant. The total staff is around 30.

Necessary documents have been supplied and the servicing instructions are normally explained to the workers.

No maintenance costing is performed.

3. Al-Wathba Concrete Block Plant: Although three workers are allocated for maintenance and workshop, operators normally carry out maintenance work as well.

Some simple cards related to facility register and routine inspection have been prepared but are not in use.

Instructions for maintenance of certain equipment have been translated into Arabic by the manager of the plant. These cover daily, weekly, monthly and yearly inspection. It is claimed that these routine inspections are implemented by operators and workmen, followed up by the manager of the plant. However, no records are kept.

No maintenance costing is carried out. Lists of spare parts are provided. About 2,500 items are stocked and most of the maintenance work is done internally which covers building up the moulds.

4. Abu Dhabi Flour and Animal Feed Plant: There is a common maintenance team for flour mill, ship off-loading, silos and animal feed plant. The total number of staff amounts to 16, including workshop workers. All maintenance workers are on a 24 hour call and there is always one assistant technician on second shift. For any breakdown, the mechanic is called in by telephone.

Job descriptions outlining the responsibilities and duties of the maintenance team are not defined. It is claimed that everybody knows his duty well.

Operating manuals and servicing instructions are available and being used by the operators and maintenance staff regularly.

There is a simple facility register card for certain electric equipment and motors. General inspection on a daily, weekly, monthly, quarterly, bi-annual and annual basis is practised and the findings are recorded for certain equipment and in particular electricals.

Repairs made on eletrical equipmewnt are recorded on formats prepared for this purpose.

Weekly maintenance schedule for electrical equipment are prepared and implemented, and the type of work done is recorded on the chart.

It is claimed that weekly maintenance of other equipment is also done, but the results are recorded in a log-book in a general manner.

Each year the plant is shut down for about 15 days. Annual and bi-annual maintenance is carried out during this period, but proper rcords are not kept.

The elements of maintenance are established only partially as related to electrical equipment. This is to be enlarged and extended to cover all machines and equipment in the flour mill, ship unloading, silos and animal feed plant.

Work orders in written form are not issued. They are communicated verbally.

Maintenance costing is not practised. The list of spare parts is provided and the necessary spares are available in the store. About 4,000-4,500 items are stocked.

All maintenance work, such as metal work, is carried out internally. Safety inspection related to lifts of silos and flour mill and special painting of equipment, steel structure and piping, which is done once every four years, are performed by special contractors. Inspection equipment for noise, vibration and cracks is not available.

5. Abu Dhabi Bags Plant: Only two out of the 49 staff members of this plant are assigned to maintenance: a mechanic and an electrician.

Technical documents have been supplied, but instructions for assembly and disassembly are not sufficient.

Facility register cards are not available, although daily inspection as regards lubrication and filters is carried out. However, no records are kept.

Certain maintenance schedules for the main line of bag making are prepared as well as daily checks on motors and pumps. The work done is recorded in log-books.

Work orders are not issued. This is done verbally. Maintenance costing is not practised either.

Spare parts are available. About 1,500 items are stocked. Tagging and carding are done but incomplete.

All repair work is done internally. Instruments for noise, vibration and crack detection are not available.

III. Conclusions and Recommendations

1. In the absence of proper recording and planning of maintenance in the plants visited, the maintenance work is carried out irregularly and mostly related to unplanned emergency maintenance. Therefore it is essential that steps be taken in the direction of setting up proper procedures as related to registry and recording starting from facility register, maintenance schedules and maintenance recording. To start with, it is suggested that a card index system be used.

The utilization of computers in maintenance management in the plants such as cement and flour mill at a later stage, will depend on the extent of maintenance activities. This, however, cannot be started unless a proper recording system exists.

Since the concrete block plants are considered small plants, less sophisticated systems should be adopted.

The system used presently covering electrical equipment only in the flour and animal feed plant should be extended to cover all equipment.

Costing of maintenance ought to be introduced, at least in the cement and flour mill plants. Although this may require additional clerical work, it is considered a useful tool for management to assess trends, to enable it to take necessary steps to reduce cost. A simple form (see figure 5) may be used for this purpose.

It is also essential that all work orders be issued in written form, at leat in the cement and flour mill plants.

The functions, duties and responsibility of the maintenance team should be clearly defined.

Annual maintenance planning should be initiated, with a staff to be assigned to follow up the implementaton.

Although it is claimed that all technical documents are available with the plants, it is necessary to check, these against the list given in section II-4 of this report to ensure that all information related to servicing and trouble-shooting is on hand. It is also necessary to ascertain the availability of documents related to manufacturing of certain spare parts locally.

2. In order to implement these suggestions effectively and efficiently withing minimum time, it is recommended that highly specialized full time expertise be assigned to this work. As most staff in the plants are presently fully occupied with daily work, it is advisable to recruit a consultant, financed by GIC, for a period of one year to supervise daily all six plants and to ascertain the proper implementation of procedures recommended. ESCWA would be ready to assist in locating and recruiting such a consultant on behalf of GIC.

3. It is recommended that measuring equipment for noise, vibration and crack detection be employed.

This equipment has proved a very useful tool and not expensive to buy. Visual inspection is far from being enough and the adoption of monitoring techniques indicating physical changes would lead to better results in maintenance work.

4. As the number of spare parts items stocked presently at Al-Ain cement plant is considered high, it is necessary for a proper inventory management system for spare parts to be set up. This requires an analysis of the present stock in order to identify costly stock and their frequency of consumption. The possibility of setting up a micro-computer-based inventory management system is to be examined. The possibility of using the existing apple computer, or purchasing another computer type with a relatively large disc capacity is to be studied.

Necessary steps have been taken by ESCWA to recruit a consultant to undertake this activity as the in-house expertise is not available. A 2-3 week mission by this consultant, financed by ESCWA, would be sufficient to assess the extent of the programme and resources needed.

5. It is important that a technical group be set up in each plant to study and analyse reasons for failures. When failure occurs, it is not enough to repair the equiment, but it is much more important to study carefully the reasons for the failure in order either to eliminate it completely in the future, or at least to prolong the time between failures.

6. It is also important, that a Standing Committee be formed at GIC to set up a Maintenance Strategy and monitor and follow up procedures and planning in each plant.

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برنامـــــج
الامـــــم المتحـــــدة الانمـــــائي
مكتب الممثل المقيم
ص.ب: ٣٤٩٠ - ابوظبي - الامارات العربية المتحدة
هاتف: ٣٢٤٩٨٧
برقياً: أندفبرو ابوظبي
تلكس: ٢٢٧٢٧

Date 10 March 1987 التاريخ .....

Our Ref. PRO/303/ESCWA - 334 المرجع .....

ANNEX I

Dear Mr. Jabbar,

Subject: Assistance to Existing Industries in the ESCWA Region

This is with reference to our cable Misc 213 dated 5 March 1987, confirming the UAE interest in the above project. Please find herewith ... two explanatory letters received from the Emirates Industrial Bank and the General Industrial Corporation requesting ESCWA assistance as indicated in the project document attached to your letter of 25 January 1987.

I would be grateful if we could receive your advice on the matter as soon as convenient.

With kind regards,

Yours sincerely

Akram Qursha
Resident Representative

Mr. K. Jabbar,
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المؤسســـة العامـــة للصناعـــة
ص.ب : ٤٤٩٩ - أبوظبي
هاتف ٢١٤٩٠٠XXXXXX
تلكس : ٢٢٩٣٨ جيكورب اي ام
برقياً : جيكورب

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ate .....

الرقم : ٨٧/٥٤٦/٥٨
التاريخ : ١٩٨٧/٣/٧

سعادة / أكرم قورشـــــة المحترم

" الممثل المقيم لبرنامج الأمم المتحدة الانمائى "
ص.ب : ٣٤٩٠ - أبوظـــــبى

تحية طيبة وبعد ،

الموضوع / مشروع الاسكوا لتقديم المساعدات الفنية للصناعات القائمة ٠

فى البداية نتقدم بخالص شكرنا وتقديرنا على ماورد بخطابكـــــم رقـــــم (PRO/303/ESCWA - 239) بتاريخ ١٩٨٧/٢/٢٤ للمساعدة بالنهوض بالصناعات القائمة٠

ونود أولا أن نشير الى أن المصانع التابعة للمؤسسة العامة للصناعة هـــــى:

١) مصنع اسمنت العين
بدء انتاجه عام ١٩٧٦٠
وطاقته التصميمية (٧٥٠) ألف طن سنويا من الاســـمنت العادى والمقـــاوم ٠

٢) مصنع أبوظبى للدقيق
بدء انتاجه عام ١٩٧٨٠
وطاقة الطحن التصميمية (٤٠٠) طن قمح/ يوم ٠

٣) مصنع أبوظبى للعلف الحيوانى
بدء انتاجه أواخر ١٩٨٠٠
وطاقته التصميمية ٢٠ طن/ الساعة ٠

٤) مصنع أبوظبى لانتاج الأكياس
بدء انتاجه عام ١٩٧٨٠
وطاقته التصميمية ٣٠ مليون كيس / سنويا بالورديـــــة من أكياس تعبئة الاسمنت ٠

٥) مصنعى الطابوق الاســـمنتى بالوثبة والعين ٠
بدء انتاجهما عام ١٩٧٩ ٠
والطاقة التصميمية لكل مصنع (٣) مليون طابوقـــــة سنويا / وردية ٠

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تلكس : ٢٢٩٣٨ جيكورب اي ام
برقياً : جيكورب

No. .....
Date .....

الرقم : .....
التاريخ : .....

(٢)

ويسعدنا أن نتقدم بطلب المساعدة فيما يتعلق بالآتـــــى :

أولا : بالنسبة لجميع المصانع الوارد ذكرها سابقا .

١ - الأسلوب الأمثل للصيانة الوقائية (Privintive maintinance) ووضع برنامـــــج تنفيذى لهذه النوعية من الصيانة ، وكذا وسائل ترشيد تكلفة الصيانة لهذه المصانـــــع بوجه عام .

٢ - وضع برنامج لرفع كفاءة العاملين من الكوادر الوطنية .

ثانيا : بالنسبة لمصنع اسمنت العين فقط .

١ - عمل مسح للمخزون من قطع الغيار بالمصنع وتصنيفها وتبويبها ، ووضع برنامج لأدنـــــى مخزون من قطع الغيار فى ظروف التشغيل ومعدلات الاهلاك الحالية .

٢ - تقييم معدلات الاهلاك الحالية لقطع الغيار الرئيسية بالمصنع ، وبحث امكانية اطالـــــة العمر الانتاجى لهذه القطع .

٣ - موافاتنا بأسماء الشركات والمصنعين لقطع الغيار لمصانع الاسمنت ، وكذا مدى امكانيـــــة تصنيع بعض هذه القطع محليا ، وذلك للتغلب على ارتفاع أسعار قطع الغيار ، وكـــــذا التباين الكبير فى الأسعار بين الموردين المختلفين .

وللعلم فان الشركة المنفذة لمصنع اسمنت العين هى :

((I shikawajima - Harima Heavy Industries CO., Japan (IHI) .))

ونود أن نشير الى أن المساعدة المطلوبة حاليا هى فى اطار الفعاليات من (١ - ٥) الـــــواردة بخطابكم السالف الاشارة اليه ، والتى تمول من قبل الأسكوا .

وتفضلوا بقبول فائق الاحترام ، ، ،

عيسى عبدالرحمن عتيق
المدير العـــــام

امارة ابوظبي
المؤسسة العامة للصناعة

22 June 1987
NK/OS

ANNEX II

Report on Mission to Abu Dhabi, UAE
1/6/1987 - 11/6/1987

by
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Regional Adviser

I. Objectives

The main objective of the mission was to attend to the request of the General Industry Corporation of Abu Dhabi (UNDP letter PRO/303/ESCWA-334 of 10 March, 1987) as related to assistance to existing industries in the field of preventive maintenance.

Other secondary objectives were:

- To urge the officials to send representatives to the Intergovernmental Expert Meeting on Capital goods and Engineering Industries, which the Industry Division will hold in Baghdad during 4-5 October 1987.

- To urge the concerned authorities to send their comments on the study entitled "Framework for the development of technological capabilities in the oil refining and petrochemical industries in the ESCWA region" which was prepared by the Industry Division.

- To promote the forthcoming workshop on "Main Marketing issues in petrochemicals and fertilizers and their implications on future investments "which the Industry Division will hold in Amman during 22-24 September 1987.

- To follow up projects of UNIDO's contribution to the Fourth Country programme as per UNIDO telex 35453 dated May 15, 1987.

II. Activities and Findings

1. General Industry Corporation (GIC), Abu Dhabi

Key persons met

Mr. Issa Abdul Rahman Ateek	-	Director General
Mr. Mouafak Arif Zaher	-	Director of Planning and Execution
Mr. Kazim Ali	-	Head Project section

The request of GIC as contained in letter No. 58/546/87 of 7 March 1987 addressed to UNDP, Abu Dhabi, in connection with the assistance to existing industries incorporates two elements.

Element one: covers assistance to six factories in the field of preventive maintenance.

Element two: covers assistance to survey in detail store inventory of Al Ain Cement factory with the aim of identifying minimum level, assessment of present spare consumption and others.

During my first meeting with the staff of GIC, the objective of the newly formulated Industry Division project on "Assistance to Existing Industries" was reviewed. It was pointed out that this assistance, as outlined in the project document, is provided in three main stages namely: fact-finding and diagnostic stage, solution stage and execution stage. My present mission falls, however, within the first stage.

Field visits were organized to each of the following factories:

- Al Ain Cement
- Al Ain Concrete Block
- Al Wathba Concrete Block
- Abu Dhabi Flour
- Abu Dhabi Animal Feed
- Abu Dhabi Bags

Discussions were held with key staff responsible for maintenance in each of these factories. The list of questionnaires, which was prepared by me, was used as a base for our discussions. These covered almost all aspects of maintenance as related to organization, system in use, budgets, spare parts, documentation, workshop facilities and others.

From discussions conducted and data collected, it appears that systematic preventive maintenance is not practised in any of the factories visited. Although there exist certain maintenance procedures in some of the factories, a more streamlining procedure in a systematic manner is required. As both concrete block factories and the bag factory employ less than 50 people, a simple maintenance system is to be adopted in order not to overburden the management.

The findings of my visit to these factories as well as recommendations on the maintenance system to be adopted, will be dealt in a separate report which is under preparation.

With regard to element two of the request of GIC as related to store inventory of Al Ain Cement Plant, in view of the number of items in the store, which exceeds 35,000, this requires a full time consultant for 3-4 weeks. A standing committee from the staff of cement factory has already started work on this, but GIC would like to have a second neutral opinion. I explored the possibility of financing the consultant by GIC, but the response was not encouraging.

In case the Industry Division decides to implement this element as well, an outside consultant has to be recruited for this purpose.

2. Ministry of Finance and Industry - Industrial Department

Key persons met

Mr. Jaffar A. Al Fardan	-	Assistant under-Secretary
Mr. Obaid Ebrahim Drwish	-	Director
Mr. Slah Ali Morsi	-	Head of Section

The meeting started with a presentation, on the purpose of my visit to UAE, and the Industry Division work programme for the years 1986/1987 including the forthcoming Intergovernmental Expert Meeting on Capital Goods and Engineering Industries. It was pointed out that this meeting was originally scheduled to be held in 1986, but due to incomplete quorum, the meeting was rescheduled for 2-4 October 1987, and ESCWA urged and welcomed the participation of all member countries in that meeting. Mr. Al Fardan and Mr. Drwish promised to look into the matter seriously, and requested to send a copy of all documents as well as an invitation to Mr. Al Fardan to enable him to pursue the matter.

Areas of possible joint technical assistance programmes were also discussed. The difficult experience of the latest UNIDO technical advisory project was cited, but it was agreed that this should not prevent the inplementation of new joint projects in future.

3. Ruwais Fertilizer Industries - Fertil - UAE

Key person met

Mr. Badr Al Sowaidi	-	General Manager

My discussion with Mr. Al Sowaidi centred on their possible participation in the forthcoming workshop on marketing issues in petrochemicals and fertilizers to be held in Amman 22-24 September 1987 and their views on the Industry Division study on the development of technological capabilities, which was sent to them since March 1987.

Mr. Al Sowaidi promised to review the study and communicate comments thereon if any, to ESCWA within 3-4 weeks. He pointed out that it was not possible to do so earlier because he and his technical adviser would be away on a mission to Japan.

With regard to the workshop, Mr. Al Sowaidi showed interest in participating, and he promised to consider the matter seriously upon the receipt of an invitation and the background documents.

4. UNDP - Abu Dhabi

Persons met

Mr. Akram Qursha	-	Resident Representative
Mr. Sameh	-	Deputy Resident Representative
Mr. M. Soliman	-	Ass. Programme

I briefed the Resident Representative and other staff on my mission as well as the field visits to six factories in Abu dhabi and Al Ain.

I also discussed with Mr. Qursha the outcome of the UNIDO contribution in projects to the Fourth Country Programme as related to:

(a) Fujeirah Ceramic Plant
(b) Glass Container Plant
(c) Marble Factory

A separate letter will be forwarded to UNIDO on the outcome of discussions on these projects.

ANNEX I ASSISTANCE TO EXISTING INDUSTRIES IN THE ESCWA REGION

ANNEX III

Field Visit Data

1. Al-Ain Cement Plant

Date of visit: 3/6/1987
Staff interviewed:
Technical Manager - Mr. Rafat Hassan
Chief Engineer - Mr. Sameh El-Salem

1. Company name: Al Ain Cement Plant
2. Address : P.O.Box 1114 Al-Ain, Abu Dhabi
Tel. 828600
Tlx. 33527 AINCMT - EM

3. Year of production: First line 1976
Second line 1980/1981

4. Production of Portland and sulphate resistant cement

5. Cost of plant: Both lines 571 million DHs equivalent to about 159 million dollars

6. Cost of equipment: About 377 million DHs which is equal to about 105 million $ plus about 5 million DHs (1.4 million $) the cost of quarry equipment and automotives.

7. Suppliers: Main contractor IHI of Japan implemented the plant on turn key basis. Supplier of some equipment, subcontracted such as electrical - BBC - West Germany and pollution control equipment, LURGI of West Germany.

8. Designed capacity: 750,000 tonnes per year for both lines.

9. Production: In 1984 production reached about 725,000 tonnes, out of which 158,000 tonnes sulphate resistance. Due to marketing problems, the production decreased sharply in 1985. But it picked it up in 1986 and reached about 702,000 tonnes.

10. Organization: total number of employee about 447. The organization is set up as follows: the Director General and three managers under him are responsible for administration, finance and technical matters.

The Technical Manager supervises:
- Chief Engineer;
- Production Manager;
- Laboratory Manager.

The locals are about 10-15 in number.

11. Maintenance structure: The Chief Engineer supervises the work on maintenance, workshops, stores, garages, construction and industrial safety.

There is no separation between the maintenance staff and workshop staff. Maintenance teams are formed as needed from workshop staff.

Staff of mechanical workshop comprise:

Engineers	2
Foreman maintenance	1
Foreman workshop	1
Technicians	17
Oil man	1
Assist. technicians	15
Carpenter	1
Assist. carpenter	2
Skilled labour	7
Unskilled labour	5
Total	52

Staff of electrical workshop comprise:

Engineers	2
Foremen	2
Electricians	13
Assist. Electricians	12
Skilled lab.	1
Unskilled lab.	3
Total	33

Staff of Garage Comprise:

Engineer	1
Foreman	1
Technicians	9
Assist. technicians	9
Unskilled lab.	4
Total	24

12 The management claims that every staff member knows his function and responsibilities and there is no problem in assigning any job to the staff.

The maintenance is divided between electrical, mechanical and garage work. The garage takes care of maintaining all automotive and quarry equipment.

13. Training: Training is not carried out in house, or abroad. This is because almost all the staff are non-local and the appointments are made on the basis of previous experience. Hence the staff do not require any training as the management claims.

14. Technical documents: All documents related to drawings and circuits are available in English

A list of spare parts is available, but the list has been supplemented in view of working and local conditions.

Drawings as related to manufacture of spare parts are not provided by suppliers. Drawings for some simple spare parts are prepared in-house.

Full operating manuals in English are available. Servicing instructions are available in English. These are extracted and given to the maintenance team either verbally or in written form.

Servicing routines are supplied and the maintenance team are aware of it.

No language problem has been experienced.

15. Maintenance system: The facility register in the form of a card system is not set up. General lubrication and inspection are being carried out as a routine function of workmen. No scheduling cards are kept, as the management claims that the workers know the procedure because they have been doing it for some time.

Work specification as related to service and parts required for each maintenance work are not prepared in advance.

A monthly report in a general manner about the whole plant is prepared.

There is a log-book recording the maintenance work done each month on some equipment.

A carding system is used only for electric motors.

Yearly scheduling is normally prepared in the form of a bar chart with due consideration to availability and requirements of spare parts and materials. The schedules are partially implemented because the maintenance team is normally busy with unplanned maintenance. Breakdowns are sometimes analysed to find out the causes.

16. Planning: Planning of maintenance is not practised. No follow-up.

17. Work orders: No work orders issued and there is no system.

Normally a shift engineer reports a breakdown verbally. Every morning a technical staff meeting is held between the technical manager, chief engineer and other engineers. In this meeting the maintenance procedure is discussed and planned as related to any breakdown. The management claims that work orders were used some time ago, but without encouraging results. The work was performed as a team work.

18. Volume of maintenance: No record as to volume of maintenance. The management claims that all machines and equipment are serviced periodically.

19. No. of down time plant: No record as to No. of down time of plant due to maintenance and duration. The management claims that the repair on breakdown is done immediately and promptly.

20. Annual budget: The total budget of the factory for year 1986 amounted to 83.5 million DHs, out of which 3.8 million DHs were for maintenance material and 6.0 million DHs for wages and salaries of maintenance team.

The budget for maintenance including consumable operational material is prepared yearly and compared with previous years as related to amount and cost of spare parts needed for each piece of equipment.

In 1984 the budget for spare parts amounted to 2 million DHs.

22. Percentage of budget allocation for maintenance: from the above figure it amounts to more than 10 per cent.

23. Maintenance costing: No actual maintenance costing is recorded.

24. Loss: Actual loss in production due to breakdown is not recorded.

25. Subcontracting: There is subcontracting for maintenance, except lining of conveyor rollers. Sometimes, X-ray is rented from outside but this is very rare, it happened only once during the last four years.

26. Spare parts: Lists of essential spare parts are supplied and available in the store. Total items stocked in stores estimated about 35,000 items: their value is estimated at about 35 million DHs. Codification and tagging are made properly. Minimum requirement is indicated on each card. The stores are classified and arranged in such a manner that any item could be identified and located easily.

No problem with supplier or in ordering and clearing the parts.

All parts are imported except some which are made in the workshop. These are very few. The staff of stores, who are under the supervision of the chief engineer, comprise:

Chief of stores	1
Store keeper	5
Assistant store keepers	4
Computer programmer	1
Skilled labour	2
Unskilled labour	2
Total	15

There is an apple computer. About 5,000 items have been fed into it but it is out of order. It is expected to computerize the storework when it is repaired.

27. Workshop: The organization of the workshop is combined with the maintenance. The facilities installed in the workshop comprise:

Lathes	2
Melting machine	1
Shaper	1
Bending machine	1
Rolling machine	1
Press	
Welding machine	1

All kinds of maintenance are done in the workshop, in particular metal works such as repairing buckets and forms etc.. Measuring equipment as related to vibration and noise is not used.

2. Al-Ain Concrete Block Plant

Date of visit:	3/6/1987
Staff interviewed:	
Technical Manager	Mr. Mohamad Khalfan
1. Company name:	Al-Ain concrete block plant.
2. Address: P.O. Box 1114 Al Ain, Abu Dhabi	
Tel: 828600	
Tlx: 33527 AINCMT - EM	
3. Year of production:	Commercial production 1979/1980

4. Activity and products: Different sizes of concrete blocks in particular hollow 8 inch concrete blocks.

5. Cost of plant: The cost of plant about 23.7 million DHs (6.5 million $).

6. Cost of equipment: The cost of equipment including automotives amounts to 14.4 million DHs (3.95 million $).

7. Supplier of equipment: The plant was constructed on a turnkey basis by IPE of Switzerland. The suppliers were OMAG and TEKA both of W. Germany.

8. Designed capacity: The capacity is 3 million blocks per year of 8 inch block.

9. Production latest years: Production during 1986 exceeded 3 million blocks of various sizes.

10. Organizational set-up: The total number of staff in the plant is 30 for one shift operation. In case of two shifts, the number becomes 44.

11. Maintenance structure: The operators carry out maintenance work.

12. Job Description: No written job descriptions are set up. But all the operators and the staff know their duties properly.

13. Training: As most of employees are non-locals, no training is carried out. Appointments are based on previous experience.

14. Technical documents: Lists of spare parts are provided as well as drawings and circuits. Operating manuals and servicing instructions are available in English. These are explained verbally to labourers.

15. Maintenance system: Some cards as related to routine maintenance and inspection of equipment have been prepared and filled out regularly. Scheduling for preventive maintenance is prepared.

16. Planning of maintenance: None.

17. Work orders: none; All work is done on the basis of verbal communication.

18. Machines serviced: Claimed that all machines are serviced regularly.

19. Breakdown time: None.

20. Company budget: Total budget runs around 6.0 million DHs (1.6 million $)

21. Maintenance budget: For repair and maintenance the material plus wages estimated at about 300,000 DHs (82,000 $).

22. Maintenance costing: Not done.

23. Cost of loss: No loss incurred due to maintenance.

24. Subcontracting in maintenance: Not let, all maintenance are done either by the plant or through cement plant.

25. Spare parts: A list of spare parts has been provided by the supplier. Most spare parts are available in the store of cement plant, as the store is a common one for both cement plant and block plant. All transactions related to purchasing and financing carried out by cement management. Number of items stocked is about 2,700 items.

26. Workshop: Most of the maintenance and repair is done through the workshop of cement plant.

3. <u>Al-Wathba Concrete Block Plant</u>

Date visited:	4/6/87
Staff interviewed:	
Manager(acting):	Moustafa Mohd. Kamel
First accountant:	Ali Hassan Jaffar

1. Company name: Al Wathba concrete block plant
2. Address : Al Wathba, al Ain Road
   P.O. Box 4781 Abu Dhabi
   Tel: 05121158
   Tlx: 22938

3. Year of production: Beginning 1980 commercial production.

4. Activities and products: Different sizes of concrete blocks in particular hollow 8 inch concrete blocks.

5. Cost of plant: The cost of plant about 23.7 million DHs (6.5 million $).

6. Cost of equipment: The cost of equipment including automotives amounts to 14.4 million DHs (3.95 $).

7. Supplier of equipment: The plant was constructed on a turn-key basis by Messrs. IPE of Switzerland. The suppliers were OMAG and TEKA both of W. Germany

8. Designed capacity: The capacity is 12,000 blocks per 8 hr. shift of 8 inch block.

9. Production latest years: The production for the last 3 years is as follows:

1986	3,640,000	blocks of 8"
1985	4,456,000	" "
1984	4,219,000	" "

10. Organizational set-up: The total number of staff in the plant is 31 including the manager. Five locals are employed in the plant.

11. Maintenance structure: the number of staff allocated for maintenance and workshop is 3. But the operators carry out maintenance work as well.

12. Job description: no written job descriptions are set up. But claimed that all the operators and the staff knows their functions and duties properly.

13. Training: as most of employees are non-locals, no training is carried out. Appointments are based on previous experience.

14. Technical documents: list of spare parts are provided as well as drawing and circuits of the equipment.

Operating manuals as well as servicing instructions are available in English. Whenever the necessity arises, these instructions are explained verbally by the manager to labourers and technicians.

Some drawings about assembling and disassembling are available.

15. Maintenance system: some cards as related to facility register and routine inspection have been prepared but not implemented. Instructions for maintenance for automotives have been translated into Arabic by the manager. These cover inspection of daily, weekly, monthly and yearly periods It is implemented by the operators and workmen and followed up by the manager. No records are kept.

16. Planning of maintenance: none

17. Work orders: none; all work orders are given verbally.

18. Machines serviced: claimed all.

19. Breakdown time: claimed none.

20. Company budget: total budget for 1986 estimated at about 6.5 million DHs (1.78 million $).

21. Maintenance budget: for repair and maintenance for 1986 estimated 100,00 DHs for spare parts plus 260,000 DHs as wages and salaries which totals 360,000 DHs (98,630 $).

22. Maintenance costing: not done.

23. Cost of loss incurred due maintenance: claimed none.

24. Spare parts: list of spare parts has been provided by the supplier. Most spare parts are available in the store. Codification and carding system is used. No problem has been experienced with the supplier for purchase of spare parts. No problem in ordering and clearing the spare parts. All parts imported and some are purchased from local agents. Number of items stocked about 2,500 items which represents 457,000 DHs (125,205 $). The first accountant supervises the store and is assisted by a clerk.

26. Workshop: most of the maintenance repairs are done in the workshop which accommodates the following:

Lathe	1
Shaper	1
Hacksaw	1
Welding machine	1

The main activity covers:

Building up moulds.

4. Abu Dhabi Flour and Animal Feed Plant

.1 Flour Mill

Date visited:	6/6/1987
Staff interviewed:	
General Manager:	Ahmad R. El Bialy
Manager of Animal Feed Factory	Mohamed al-Mujaini
Chief Operation and Maintenance	Mahmoud El Shazili
Electrical Maintenance Engr.	Talha Mohd. T. Amer

1. Company name: Abu Dhabi Flour and Animal Feed Plant.

2. Address: P.O. Box 6622 Abu Dhabi
Tel. 722300
Tlx. 23022 ANOSM - EM

3. Year of production: First plant in 1978
Extension 1983

4. Activity and products produced: Flour of different grades and animal feed for poultry and others.

The activity covers operation and maintenance of:

- ship off-loading facilities;
- silos;
- flour mill;
- animal feed plant.

5. Cost of plant: The cost of unloading facilities plus silos and the flour mill estimated at about 185 million DHs (51 million $).

6. Cost of equipment: The cost of unloading equipment plus silo equipment and the flour mill equipment estimated at about 83 million DHs (23 million $) plus the cost of laboratory equipment of about 3 million DHs (0.8 million $).

7. Supplier of equipment: The supplier of first plant is Buhler of Switzerland and for the extension is OCRIM of Italy. The electrical supplier of first plant is Buhler as well.

8. Designed capacity:

Ship unloading facilities: 240 tonnes per hr,
Silos : 60,000 tonnes
Flour mill : two plants each about 200 tonnes/day (24 hrs.) of grain.

9. Production latest years: Production continued at its rated capacity without any reduction. Total production in 1986 amounted to 101,683 tonnes of all products.

10. Organization: Total number of employee in unloading, silos and flour mill amounts to 123. The General Manager of the factory supervises the following departments:

- Financial
- Administrative
- Laboratory
- Operation and maintenance
- Animal feed unit

The chief of operation and maintenance unit supervises the operation and maintenance of unloading, silos, flour mills and animal feed.

11. Maintenance structure: The maintenance team including workshop workers is composed of:

-	Electrical engineer	1
-	Mechanical engineer	1 (vacant)
-	Workshop foreman, mechanical	1
-	Mechanics	2
-	Assistant mechanics	4
-	Semi skilled	2
-	Electrician	2
-	Assistant electrician	3
-	Labour	1
	Total	16

The maintenance is common for the unloading facilities, silo, flour mill and animal feed unit.

There is always one assistant electrician or electrician on second shift maintenance. For any breakdown the mechanic is called by telephone. All other maintenance staff are considered on 24 hr. call.

12. Job description: No written job descriptions and functions of staff are set up. It is claimed that all staff know their responsibilities and functions.

13. Training: As most of the staff are expatriates, they are appointed on the basis of previous experience and therefore no training is required. Locals are given the opportunity of training.

14. Technical documents: All main drawings and main circuit diagrams are provided by the suppliers in English. Whenever additional drawings are needed, they are supplied by the supplier. The language is no problem.

The spare parts lists are supplied. These have been complemented according to requirements and local conditions.

Operating manuals and servicing instructions are provided by the suppliers and used by the operators and maintenance staff regularly.

15. Maintenance system: There is a facility register card for certain electrical motors and equipment. General inspection on a daily, weekly, monthly, quarterly and yearly basis is practised and recorded for certain equipment and in particular the electrical equipment.

Trouble with each machine, in particular electrical machines, is recorded as well on certain formats.

A weekly maintenance schedule for electrical equipment is prepared in advance and implemented according to a chart which indicates what kind of work should be done.

Weekly maintenance on other equipment are also done but the results are recorded in a general manner.

Each year the plant is shut down for about 15 days. Annual and bi-annual maintenance is carried out during this period.

Records for electrical equipment are kept on formats while for other equipment records they are entered in a log-book.

16. Planning of maintenance: Weekly planning of maintenance for electrical equipment is set up and followed up properly in accordance with schedules made for this purpose.

17. Work orders: No work orders issued for maintenance work. The work is carried out immediately and any breakdown is recorded in the log book.

18. No. of machines serviced: Claimed all machines are serviced during the year.

19. No. of downtime: Claimed no shut down of the plant due to maintenance has been experienced.

20. Annual budget: For 1986 about 25 million DHs (6,8 million $) which covers salaries, maintenance, packing, depreciation for unloading, silos and flour mill.

21. Maintenance budget: For 1986 about 596,000 DHs (163,300 $) plus 750,000 DHs (205,500 $) for wages and salaries related to maintenance.

22. Maintenance costing: No maintenance costing is performed.

23. Cost of loss: No calculation of cost of loss to production due to maintenance.

24. Maintenance subcontracting: No outside contractor for maintenance work except the yearly inspection (safety) for lifts in silos and flour mill. Any repair will be carried out by same party, Also special painting for equipment, steel structure and piping is done by outside company about once every 4 years.

25. Spare parts: The lists of spare parts are provided by suppliers and the necessary ones are available in the store. Certain coding is made. The small store incorporates about 4,000 - 4,500 items for ship unloading facilities, silos, flour mill and animal feed plant. The value of stocked spare parts estimated at about 2,823,000 DHs (773,400 $). The yearly order of spare parts amounts to about 1 million DHs (274,000 $). This is all imported and a small portion purchased from local agents.

The organizational set up for spares comprises one store keeper.

26. Workshop: Maintenance and workshop workers are combined. The facilities installed are:

Lathe	1		
Milling	1		
Drilling			1
Fluting machine			1
Grinder	1		
Welding and hacksaw			1

All maintenance work is done in the workshop such as metal fabrication and others.

No inspection equipment, but daily visual inspection made of noise, vibration and cracks.

4.2 Animal Feed Plant

Date visited	6/6/1987
Staff interviewed:	
General Manager:	Ahmad R. El Bialy
Manager of Animal Feed Factory	Mohamad Al-Mujaini
Chief Operation and Maintenance	Mahmoud El Shazili
Electrical Maintenance Eng.	Talba Mohamad T. Amer.

1. Name : Animal Feed Plant

2. Address: P.O. Box 6622 Abu Dhabi
Tel. 722300
Tlx. 23022 ANOSM - EM

3. Year of production: 1981

4. Activities and products: Different types of animal feed, for poultry and others.

5. Cost of plant: About 52.6 million DHs (14.4 million $).

6. Cost of equipment: About 22.4 million DHs (6.1 million $).

7. Supplier of equipment: BUHLER of Switzerland.

8. Designed capacity: About 20 tonnes per hr.

9. Production: The production reached about 66,809 tonnes during year 1986.

10.Organization: The plant is under the same management as the flour mill. Total number of operators and production staff amounts to 45.

11. Maintenance management: Common maintenance team for both flour mill and animal feed plant.

12.through 14: Same as flour mill.

15. Maintenance system: Maintenance is carried out only on Fridays and holidays in order not to lose production.

16 through 19: Same as flour mill.

20. Annual budget: For 1986 about 9 million DHs (2.46 million $).

21. Maintenance budget: For 1986 about 320,000 DHs (87,670 $) for spare parts including spares for hammer mills (which is considered a normal wear part) plus 250,000 DHs (68,493 $) as salaries and wages for maintenance team.

22 Through 26 same as flour mill.

5. Abu Dhabi Bags Plant

Date visited:	7/6/1987
Staff interviewed:	
Manager (acting)	Abdu Raheem Moneeb

1. Name: Abu Dhabi Bags Plant.
2. Address: P.O. Box 6828 Abu Dhabi
Tel. 544100
Tlx. 22580 ADBAG - EM

3. Year of production: Beginning 1978

4. Activity and products: Paper bags for cement and other chemical products. Plastic bags, heavy duty for fertilizer and other uses.

5. Cost of plant: Total cost about 40.4 million DHs (11.07 million $).

6. Cost of equipment: For paper bag line 19.3 million DHs (5.29 million $); for plastic bag line 3.1 million DHs (0.85 million $).

7. Supplier of equipment: Main contractor (turnkey). Messrs. ROTHRIST of Switzerland. The main supplier of equipment for paper bag line: WINDMOLLER AND HOLSCHER of W. Germany. The main contractor is the supplier of equipment for plastic line.

8. Designed capacity: For paper bags about 300 bags per minute, about 30 million bags per year. The capacity of plastic extruders is about 2 tonnes per day for 3 shifts.

9. Production: The production during the last three years was as follows:

1986	20,263,000	paper bags and 53 tonnes of plastic bags.
1985	23,260,000	paper bags and 84 tonnes of plastic bags.
1984	30,000,000	paper bags and 100 tonnes of plastic bags

The paper bags are mostly for cement and partly exported. The plastic bags are for garbage and compost.

10. Organization: Total number of staff is 49 of which 9 are locals. Three main departments operate under the manager. These are:

Administration, finance and operation. The operation department is headed by shift foreman.

11. Maintenance management structure: Only two technicians, one mechanical and the other electrical (at present this post vacant) are working on maintenance.

12. Job description: The functions and description of duties of each staff are conveyed verbally.

13. Training: At the commissioning stage two experts from the supplier trained the staff for a short time. All appointments based on previous experience.

14. Technical documents: Drawings and circuits have been supplied by the supplier. Spare parts lists have been provided but the list was complemented later by the staff based on prevailing conditions.

Instructions for assembling and disassembling are provided by the supplier but not sufficient. The staff is now experienced in carrying out the maintenance work.

Operating manuals are supplied.

15. Maintenance system: no facility register cards are available. Daily inspection is performed as regards lubrication. A chart for oil change during certain periods is set and implemented accordingly.

A weekly maintenance schedule is prepared for the main lines. There is also a daily check on motors and a maintenance schedule for pumps.

Every week, normally on Thursdays, the plant is shut down for maintenance, provided the production programme allows it.

Maintenance is also carried out when the line is stopped for the purpose of changing the type and size of bags to be produced.

All breakdowns are registered on log-books

16. Planning maintenance: No yearly planning.

17. Work orders: No work orders, the work is carried out through verbal communication.

18. No. of machines serviced: Service is done on all machines but the volume is not quantified.

19. No. of down times: No complete breakdown due to maintenance has been experienced. Repairs are made immediately.

20. Company budget: Total budget of company for year 1985 amounted to about 14 million DHs (3.8 million $) out of which 1.6 million DHs (0.44 million $) as salaries and wages.

21. Maintenance budget: The total cost of maintenance excluding wages and salaries in 1985 amounted to 103,000 DHs (28,200 $) as compared to 142,900 DHs (39,000 $) in 1984 and 197,492 DHs (54,107 $) in 1983.

22. Maintenance costing: No actual costing for maintenance is performed.

23. Plant loss due to breakdown: No loss in production due to breakdown has occurred.

24. Subcontracting: No subcontracting as related to maintenance is let.

25. Spare parts: the list of spare parts has been provided and all necessary parts are available in the store. A carding system is used but no indication of minimum requirement of the parts. No problem with the supplier for ordering the parts.

The total stock estimated at about 500 items. The value is estimated at about 1 million DHs (274,000 $). One store keeper is in charge.

26. Workshop: all repair work is done as well as metal work. The machines installed are:

Lathe	1
Frazer	1
Drill	1
Welding machine	1

Figure 1

Typical Plant Register Card

Plant No.:.....

Plant and location:.....

Maker: .... Serial No:.....

..... Type.....

..... Date of purchase;.....

..... Price.....

..... Purchase order No.....

Details of plant:.....
.....
.....
.....
.....
.....

Ancillary equipment:.....
.....
.....
.....
.....
.....

Figure 2

Typical Schedule of Maintenance Card

Plant No.....

Skill	Periodicity	Schedule	
Mechanical	Monthly	Check and lubricate door mechanism	1.5 hr.
Electrical	Quarterly	Using a test set check the earth bonding and insulation	2.0 hr.
Instrument	bi-annual	Remove thermo couples and check for deterioration	2.0 hr.

Figure 3

Typical Record Card Issued to Maintenance Staff

Plant No..... Frequency and activity No.....

Summary of maintenance job:.....

.....

.....

.....

Name	Date completed	Signature

Maintenance Remarks on Reverse

Figure 4

Typical Record for Defect Analysis

History Record ..... Card NO.....

Machine..... Plant No.....Location.....

Date	Item	Defect	Cause	Action	Maintaining time	Total down time

Figure 5

Typical Maintenance Costs Form

Accounts code Date

Job No	Labour	Material	Overhead	Total