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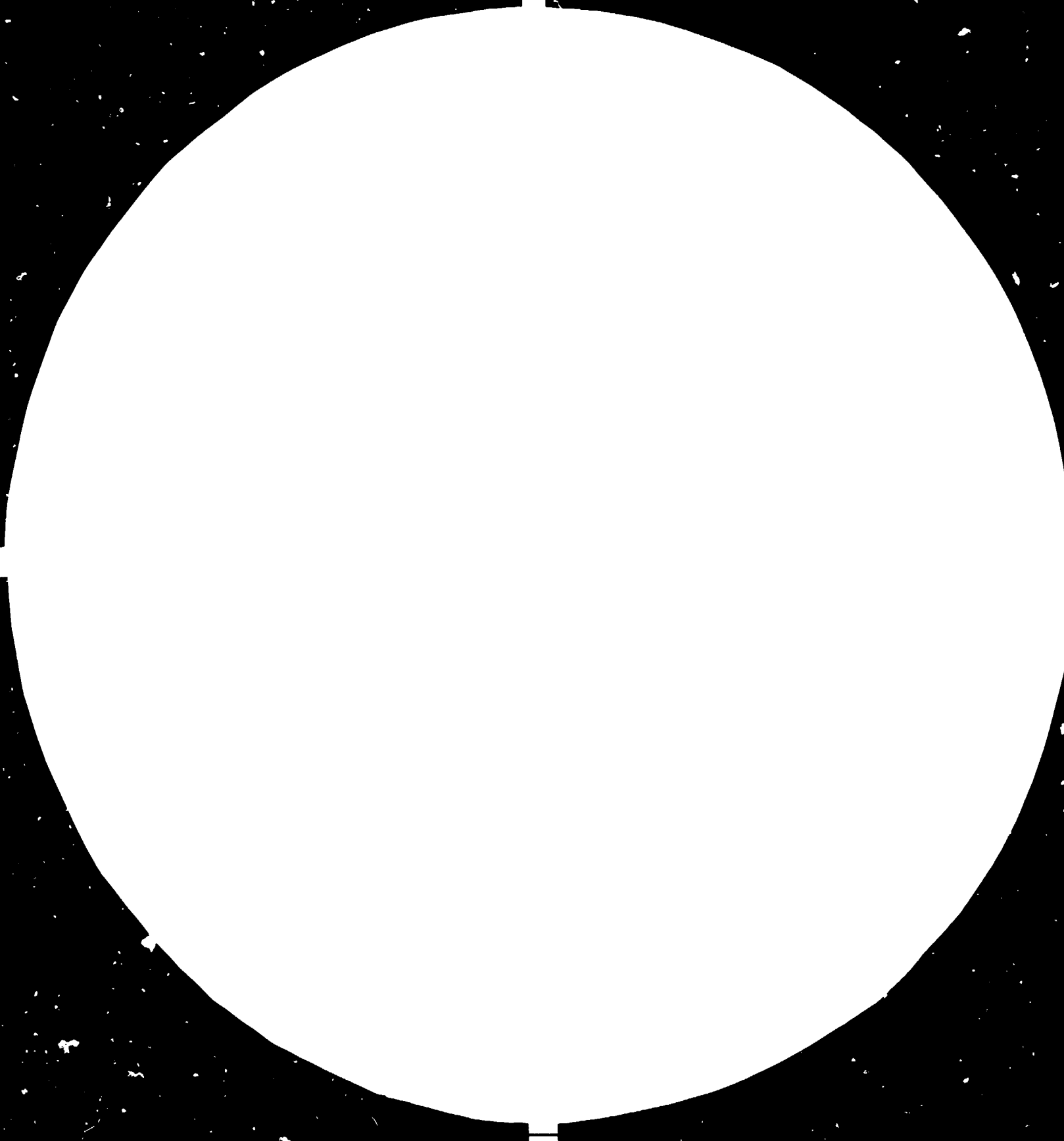

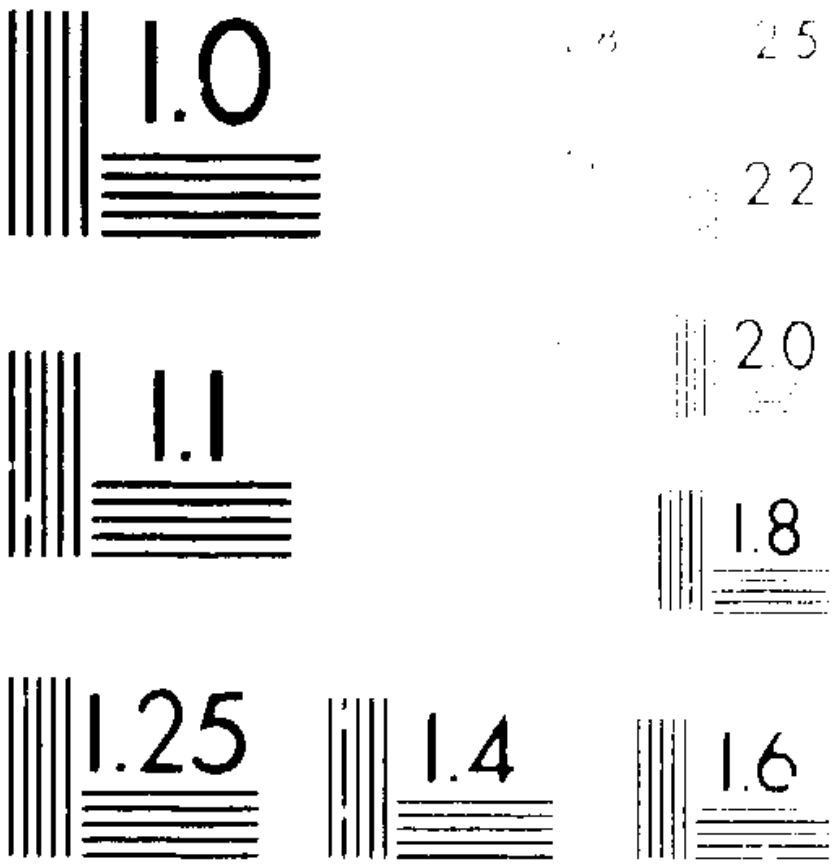
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3 January 1984
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Iraq

ASSISTANCE TO THE GLASS INDUSTRY
DP/IRQ/78/001
IRAQ

Terminal report

Prepared for the Government of Iraq by the
United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of Roman Gizara, expert in control devices
for the glass industry

United Nations Industrial Development Organization
Vienna

V.84-80131

Explanatory notes

The following abbreviations are used in this report:

kV kilovolt
mV millivolt

Mention of firm names and commercial products does not imply the endorsement of the United Nations.

ABSTRACT

Within the framework of the United Nations Development Programme (UNDP) project "Assistance to the glass industry" (DP/IRQ/78/001) an expert was sent by the United Nations Industrial Development Organization (UNIDO), acting as executing agency for UNDP, to Ramadi, Iraq, to check the operation of electronic devices and make suggestions for improvements. The mission was carried out from 3 November 1982 to 1 December 1983 with interruptions and the following main recommendations were made:

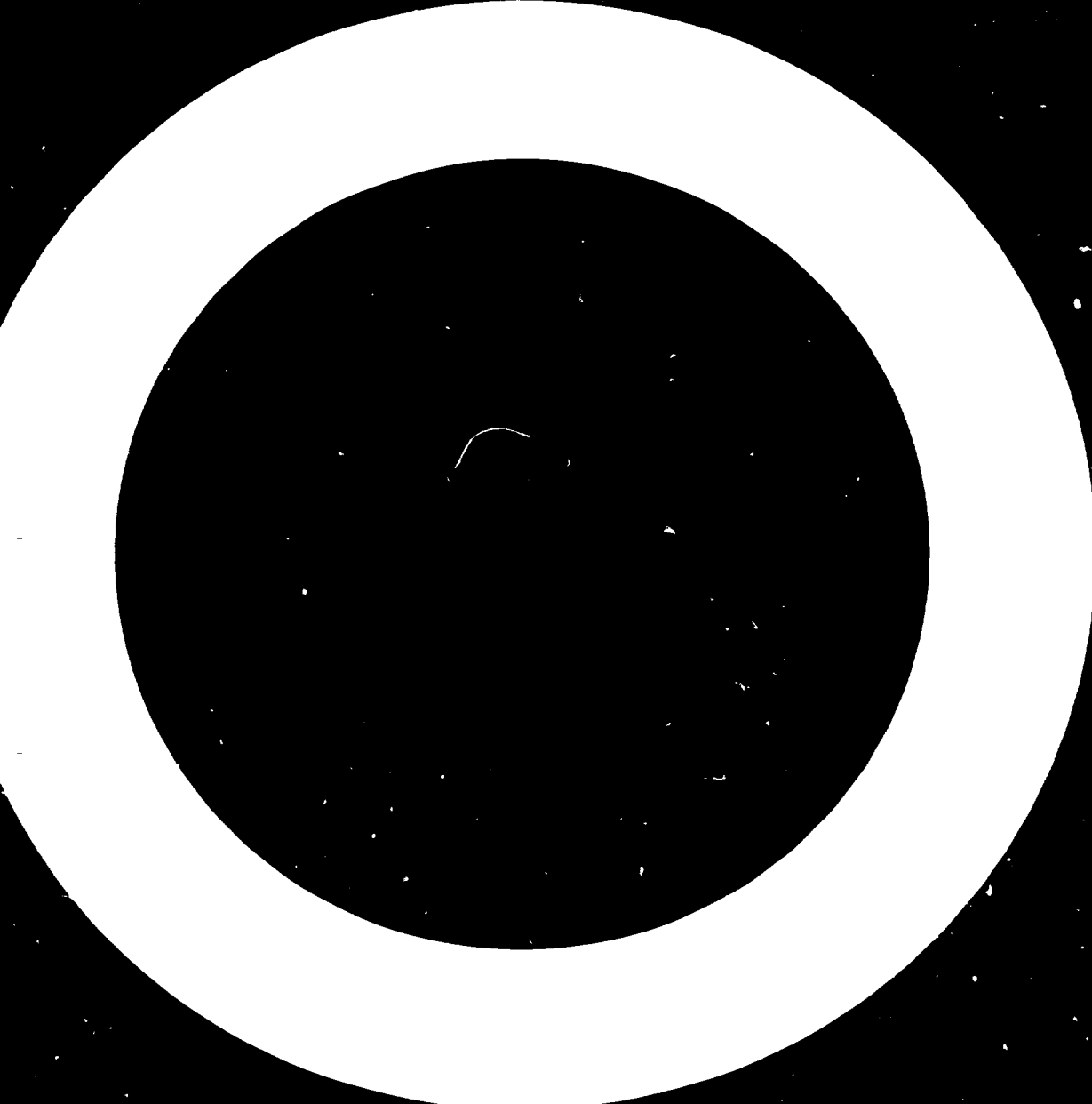
(a) An experienced automatic control equipment engineer should be recruited to supervise various teams engaged in the operation and maintenance of plants;

(b) A technician should solve problems with gas, compressed air and heavy oil;

(c) Glass-level controllers should be installed with recorders for furnaces No. 3, 4 and 5;

(d) A spare parts list of automatic equipment for the new bottles and jars plant should be made;

(e) Various automatic systems should be properly maintained.



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INTRODUCTION

In the Ramadi glass factory six glass furnaces are in operation and the new bottles and jars plant with three unfired furnaces is in the process of starting up.

Window glass plant

The plant has one furnace for the production of window glass. All machinery was erected and started by the Soviet Union company. The electric and electronic measuring and control instruments have been under the supervision of the expert from the Soviet Union company.

Furnace No. 1

The furnace was erected by the Japanese Toyo Glass Company and went into operation in 1981. It produces table glassware with two press machines and an H-24 blowing machine.

Most of the measuring and control equipment is made by Japanese companies, Yokogawa Electric Works Ltd. and Yamakate-Honeywell Co. Ltd. The furnace and feeders have electronic and pneumatic control systems. Lehrs of this furnace are equipped with electronic measuring and control instruments.

Furnace No. 2

The furnace and the machinery are similar to furnace No. 1. It was also started by Japanese specialists in 1981. The control and measuring equipment is the same as for furnace No. 1.

Furnace No. 3

The furnace, which was erected by SORG Company, produces table glassware with the H-28 machine and the Lynch press machine. The furnace and feeders have electronic and pneumatic control and measuring instruments made by Honeywell Co. Ltd. Also lehrs of this furnace made by CNUD Company have basic safety, measuring and control instruments made by Honeywell. The H-28 machine has frequency controlled electronic motor drive system made by Emerson Electric Co.

Furnace No. 4

The furnace, feeders and lehrs are similar to furnace No. 3. Measuring and control equipment are the same.

Furnace No. 5

The furnace produces bottles for Pepsi-Cola and jars with two IS-6-single-gob machines. It has an electronic measuring system. The basic instruments are made by Honeywell Co. Ltd. and the control electronic instruments are made by Leeds and Northrup Ltd. The electronic and pneumatic control instruments for feeders are made by Honeywell Co. Ltd. Lehrs after IS machines are built by CNUD Company and are equipped with Honeywell electronic instruments. IS machines have DC electronic control motor drive systems made by Emhart Company.

Decorating line for Pepsi-Cola bottles

The line is equipped with a Rosario NV Strutz-type-3 CS-100 decorating machine, a lehr built by CNUD and palletizer machinery built by Cristaleria Española. The decorating machine has electric and electronic control systems. The lehr has electronic control and safety instruments made by Honeywell Co. Ltd. The Palletizer machinery also has an electronic control system.

Decorating line for glasses and saucers

This line has Fife Kammann gold decorating machines and lehr. Kammann machines have fully automatic electronic and hydraulic control systems. The lehr is equipped with electronic control and safety instruments made by Honeywell.

Batch plant for all six furnaces

Batches for all six furnaces are prepared and transported to furnaces in a fully automatic way. There are two fully automatic electronic weighting lines made by the Toledo Company. The system, which was started in 1982, was under the supervision of the Toledo Company expert till June 1983. It is now maintained by an Iraqi team and a Polish electrical engineer.

Steam boilers

There are two steam boilers made by Turbo Flame Co. Ltd., Sweden. The boilers, which were started in 1982, have a fully automatic electronic control system with instruments made by Swedish companies and by Honeywell. The steam produced and the boilers are controlled fully automatically.

New jars and bottles plant

This plant has three complete technological lines for the production of bottles and jars, fitted up with a batch plant; three furnaces, each with three feeders and three IS machines; lehrs; and packing and decorating lines.

The production and transportation in the plant will be fully automatic. Measuring and control instruments for furnace feeders and lehrs are made by Honeywell.

The plant is under commission and cold in the process of starting up. The machinery for the plant was provided by an American company and fitted up by Polimex-Cekop, Poland.

I. RECOMMENDATIONS

1. Teams should be organized for the operation and maintenance of plants:

(a) An experienced engineer for the automatic control equipment should be recruited to form a team to work with these instruments only;

(b) For the operating plant two or three teams should be organized, each of them including three workers: an electrical technician, an electronic technician and a precision mechanic. The teams should be under the supervision of the automatic control equipment engineer;

(c) One team should do maintenance work for two or three furnaces and their associated equipment;

(d) For the new plant for bottles and jars there should also be at least one team and an engineer;

(e) Two men should be assigned the supervision of automatic equipment and repair of small failures during the second and third shifts.

2. As in the factory there are many problems with gas, compressed air and heavy oil, a technician should be assigned to solve those problems.

3. Furnace men and operators of machinery whose duties include dealing with automatic control equipment should be trained periodically by personnel of the electrical department.

4. Glass-level controllers should be installed with recorders for furnaces No. 3, 4 and 5 when these furnaces are being repaired.

5. Temperature controllers for the melting zone of furnaces No. 1, 2, 3, 4 and 5 and also for the refiner zone of furnaces No. 3, 4 and 5 should be installed later.

6. A workshop for automatic and measuring equipment only with specialized electric, electronic and pneumatic instruments and tools should be organized later.

7. A spare parts list of automatic equipment for the new plant for bottles and jars should be made. The inventory of the spare parts in the store should be made first.

8. The following recommendations are made for the proper maintenance of the automatic systems:

(a) Electric control system. The equipment should be dusted from time to time and the contacts should be cleaned at least once a year. The important thing is to protect the cables from high temperature and from mechanical damage;

(b) Electronic control system. The equipment should be cleaned at least twice a year. All electrical connections and contacts should be checked and cleaned at least once a year. The instruments must not be overheated. To ensure the continuous function of recording instruments unqualified personnel should not be allowed to do any maintenance work or to adjust instruments;

(c) Pneumatic control system. Water and oil should be removed from the compressed air. Filters, restrictors, nozzles and flappers should be cleaned or replaced once a month. Pneumatic connectors should be checked and leaks should be removed twice a year. Electrovalves should be cleaned twice a year. Instruments should be cleaned and calibrated twice a year to ensure the continuous function of recording instruments;

(d) Control valves. All control valves should be cleaned at least once a year. Maintenance work on the pneumatic motors of the respective valves should be done;

(e) Safety systems. The proper functioning of systems, for example, checking to clean the flame sensors, should be done regularly;

(f) Routine daily checks by the maintenance department chiefs must be made of instruments and systems of automatic control.

II. WORK CARRIED OUT

At the beginning of the mission the instruments for furnaces No. 3, 4 and 5 were in poor condition. The control equipment for lehrs was not functioning properly, which was dangerous. Safety and control circuits had to be checked. As the glass factory did not have specialized instruments for testing the flame sensors and flame relays, simple testing method was suggested for fast check of these instruments, using the conventional instruments. Also the testing circuit for full testing of these equipments was made in the workshop. Temperature controllers were tested and replaced by new ones if they were damaged. The gas service department made maintenance checks of the gas and air equipment and also replaced many instruments that were not in a good condition by new ones. This ensured the possibility of normal operation and the control of burners.

Staff were trained for nine months in the correct daily maintenance of the lehrs. When lehrs began operating normally the method of calibration of temperature measuring instruments was discussed with counterparts and the repair and testing of temperature controllers indicators and recorders for lehrs were demonstrated. All instruments for working lehrs were tested. About 70 per cent of pressure switches, time relays and similar instruments with plastic parts installed in a very hot area were damaged by too high temperature. They were repaired or replaced. A lot of problems were caused by inconstant composition and calorific volume of gas and by liquid gas present in gas piping system in winter-time.

The proper operation of feeders temperature control systems was discussed as well as the maintenance of temperature recorder controllers pyrometers and pneumatic motors for control valves. Cooling systems for temperature sensors were not functioning properly so that 50 per cent of these instruments had to be replaced because they were damaged by high temperature or because they were not accurate. Temperature recorder-controllers did not work properly either, they had low accuracy, the recording systems were broken, and the pneumatic controllers either did not control temperatures automatically or controlled them incorrectly. Also, the pneumatic motors for the control valves were not in good condition. The team started to operate cooling systems for pyrometers, cleaned, lubricated and calibrated temperature controllers and adjusted pneumatic motors for control valves. This made possible the automatic control of the temperatures feeders. The control valves should also be maintained by the Gas Service Department. The expert trained factory staff during his first mission to maintain the equipment. The proper operation of feeders and lehrs ensured higher production and better quality.

Electronic instruments for furnace No. 5 were also in poor condition. Only temperature recorders worked properly. Together with the technician who maintains this furnace the expert calibrated temperature recorders and instruments for measuring air and oil flow and furnace pressure.

After electronic controllers had been repaired and electric servo-motors for control valves had been adjusted, systems for automatic operation were started. The electrically operated reversing system for this furnace did not function properly. It is very difficult to make changes in this system in the operation of the furnace because the reverse has to be done every twenty minutes. The changes should be made during maintenance time.

Towards the end of his first mission, the expert supervised the systems and trained the technician in proper maintenance. Furnaces were controlled automatically. For furnaces No. 3 and 4 the expert maintained and calibrated temperature recorders. Before calibration recorders worked with very low accuracy, i.e. higher than ± 10 per cent. The normal accuracy of these instruments is less that ± 0.5 per cent. The low accuracy was caused by inadequate maintenance and adjusting by personnel. Some problems in pneumatic reversing system of the furnaces were also settled.

Some problems were also settled in the electronic driving systems for IS and H-28 machines, compressors, turbogenerators and other electrical equipment.

In March 1982 the expert discussed with the Chief of the Electrical Department and the Japanese specialist the spare parts list for automatic equipments of furnaces No. 1 and 2. The list was prepared by the Japanese contractor for the glass factory. Corrections were made and the factory sent the list to the contractor for realization.

In summer 1982 the factory started a new batch plant with steam boilers and a decorating line for bottles. The equipment for steam boilers and the decorating line did not work properly. In winter there were problems in the firing systems of glass furnaces, feeders and lehrs.

As the steam boilers are very important and did not work properly, the expert tested ignition system, oil and air flow control systems, water level control equipment and pressure safety switches of the boilers. The expert also completed the spare parts list for these equipments and trained the maintenance team. At the beginning of winter there were many problems with the decorating line for bottles because the line was situated in a cold area. Together with the factory team the expert checked firing control system for the lehr and the palletizer oven as well as automatic equipment for the palletizer. Two technicians were trained in maintenance

The protection equipment was tested for two main electric feeders of the power station of 11 kV. This equipment, which should be tested once a year, had never been tested since its installation 14 years before. Also the expert removed some faults in automatic equipments for 3-mV turbogenerator, compressors, IS and H-28 machines.

The equipment for three lehrs after IS machines, three feeders, melting and refiner zones for furnace No. 7 were fully tested. Most of the equipment for the batch plant was tested. The rotation dryer oven for sand was fully tested during normal operation. The automatic control panel for two batch mixers was also fully tested. In this panel changes were made following the technological and the mechanical modifications made by the glass factory. Mechanical and technological modifications were taken from the batch plant built for the works furnaces. As the mechanic team had not finished mechanical adjusting of balances, we could not finish our work on the batch automatic weighting line. About 70 per cent of this line was tested. There are not enough spare parts for the proper operation of the control and measuring equipments of the plant.

In October 1983 the factory team repaired a small furnace of the silicate glass unit. Automatic control instruments for this furnace did not function properly from the beginning of the operation. The furnace was controlled by hand. Together with the factory team the expert started to operate temperature automatic control equipment and safety systems for the furnace and the recuperator. The furnace is now controlled automatically.

III. FINDINGS

The control system in the window glass plant is under the supervision of the expert from the Soviet Union. Before the repairs that were made last year, the instruments were not in a good condition and many failures occurred. In the repairs most instruments were maintained, but some, which were considerably worn, were replaced by new ones. Now the control and measuring equipment works in a satisfactory way. There is a considerable amount of the basic spare parts in storage.

Instruments for technological lines of furnaces No. 1 and 2 were maintained by the Japanese specialist and by the Iraqi technician for one year after the start-up in 1981. At the end of 1981 the spare parts for further use were transferred from the Japanese contractor to the glass factory and also a spare parts list was made to ensure the availability of spare parts for two years. From June 1982 to January 1983 the control systems were maintained by Iraqi and Polish technicians.

Instruments are in a fairly good condition and work properly. In winter breakdowns often occur because the oil piping system does not have a good heating insulation and because the maintenance of the oil and the gas equipments is not satisfactory. This year there have also been minor problems with spare parts for the automatic equipment because the spare parts list was realized too late.

In 1981 measuring, control, and safety systems for technological lines of furnaces No. 3, 4 and 5, which have been under factory team supervision, were not in a satisfactory condition. Safety systems for lehrs were practically blocked. Most controllers did not work automatically. Dangerous situations occurred frequently due to unexpected power cut-offs, specifically lehrs were affected because of uncontrolled ignition of gas fed into the lehr. However, necessary precautions to avoid further damage were taken.

When it is cold there are also problems with the liquid gas in the gas piping system, the water in the air compressed piping system and the oil using for heating furnaces. These systems are not in a good condition and are also not properly maintained, which very often causes breakdowns, fires etc. Now minor problems with the control equipment can be solved by the factory team. In the store there is a considerable amount of the basic spare parts, but gaskets, rings, resistors and similar small parts are not stored.

The control equipment for the decorating line for Pepsi-Cola bottles is maintained by factory staff.

There were many problems with the equipment, especially in winter 1982/83, when the liquid gas and the water in the compressed air appeared in the gas piping system.

It is practically impossible to keep the palletizers in operation if the outside temperature is below $0^{o}C$ because of the presence of the liquid gas in the piping system.

The gold decorating line for glasses and saucers was operated properly for about three months after the line went into operation in April 1983. Now every week Kamman decorating machines break down. The machines are modern and

should be maintained by experienced supervisors. The training provided by Kamman's specialists was too short and not full. Also the glass factory does not have a manual for the most important part of the machine, the electronic equipment. Without a manual with drawings it is very difficult to solve problems. The lehrs also break down from time to time. There is no cooling system for UV sensors (flame detectors), so the sensors were overheated in summer. At the beginning of winter problems with the gas started.

The contractor has transferred to the glass factory a considerable quantity of basic spare parts.

The batch plant for all six furnaces is in operation. It is under the supervision of an Iraqi electrical engineer and a technician together with a Polish electrical engineer, who succeeded the Toledo specialist. The training, which was provided by the Toledo specialist, was good and now the Iraqi team maintains well the modern electronic, electric and pneumatic equipment. A good quantity of spare parts is stored.

Steam boilers were erected in 1981 and started in 1982. At the beginning of the cold time factory staff had problems with the boilers because the oil piping system did not have good heating insulation, so it was difficult to make starting fire since the boiler and all systems were cold. At first the boilers were not properly maintained, which caused damages of instruments. Now that the personnel has been trained, boilers work in a satisfactory way. A spare parts list for automatic and electric equipment was also made.

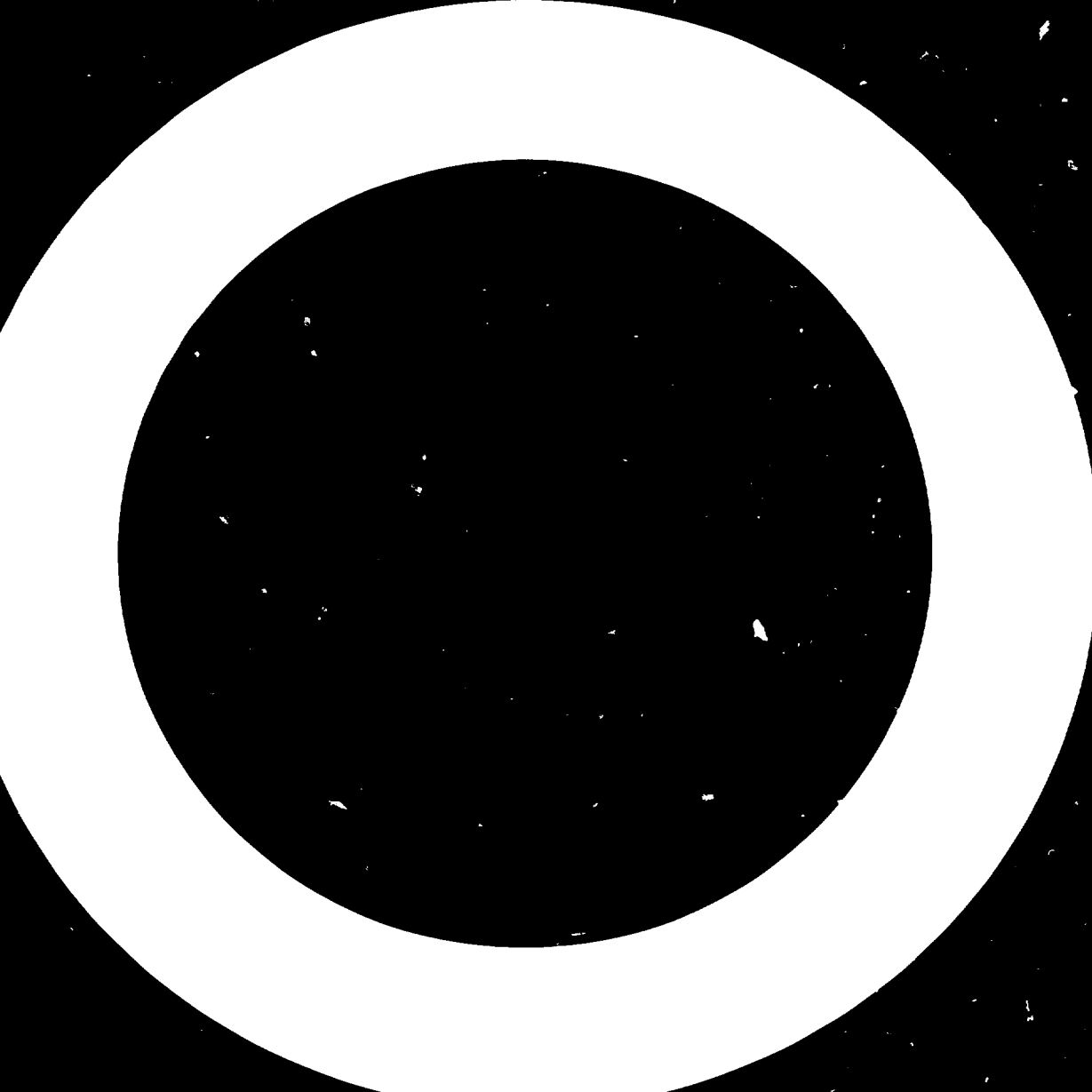
The new bottles and jars plant is in the starting-up process. Together with the Iraqi team the expert tested, calibrated and started up to operation measuring and control equipments for furnace No. 7, lehrs after IS machines and also electronic controlled weighting system for the batch. This is a good way of training the factory team, because in the starting-up process different problems have to be solved. The training will be completed if it is carried out in a similar way during the hot starting-up process. In the store there are not enough spare parts, so a new spare parts list should be made and sent to the contractor for realization.

Maintenance team

There is only one specialized team for the maintenance of automatic equipment of the batch plant and this team makes sure that the control and measuring systems operate properly. There are no specialized teams for control devices of furnaces, lehrs and other machinery. There is also no experienced engineer for measuring and automatic control devices. For each furnace with technological machinery there is only one worker to supervise the electric machinery and the electronic and pneumatic instruments for the whole line. There are no maintenance staff for the second and third shifts.

Many members of the staff are foreigners, which means that staff change very often.

Workers have lost many hours because the workshop does not have enough tools and simple instruments. That is also the general problem of the factory. As the qualification and the experience of the staff are not high, the present staff is too small to ensure proper maintenance. The personnel of the electrical department can now carry out some of the work that has been demonstrated.



Annex

JOB DESCRIPION

DP/IRQ/78/001

POST TITLE : Expert in control devices for the glass industry.

DURATION : Nine, twelve and two months.

DUTY STATION : Ramadi, Iraq.

PURPOSE OF PROJECT : To enhance the capabilities of the general company for the glass and ceramics industries and its senior staff to cope effectively with the increased demand for high-quality glass products in Iraq.

DUTIES : As a member of a team under the supervision of the team leader, the expert will work in co-operation with the head of the maintenance department and will be expected to prepare the work plan together with the counterpart and the team leader. Within the first two weeks of the assignment, more specifically, the expert is expected to:

1. Assist in the operation of the electronic devices of the entire plant.

2. Assist in repairing the electronic devices

3. Assist in spotting any faults or difficulties in the electronic devices and give quittance on how to rectify these faults and overcome these difficulties.

4. Assist in testing and calibrating all the electronic devices of the plant.

5. Assist in determining the spare parts needed by the company with respect to automatic and electronic devices and also in determining the minimum and maximum requirements in storage.

6. Train a team in the repair and maintenance of all electronic devices.

7. Make recommendations to the Government on further action to ensure the smooth operation of the plant.

QUALIFICATIONS : University degree with wide experience in electronic control of process industries, some experience in the glass industry.

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