CONFERENCE ON DISARMAMENT

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YUGOSLAVIA

REPORT ON THE NATIONAL TRIAL INSPECTION

INTRODUCTION

According to the proposal of the Ad Hoc Committee on Chemical Weapons that National Trial Inspection should be carried out by interested countries in order to verify whether it is possible to ascertain that declared chemical industry facilities are not used for prohibited purposes, a Yugoslav Trial Inspection was carried out.

Ever since the beginning of the negotiations on the prohibition of the use of chemical weapons, Yugoslavia has supported all the proposals related to the national verification measures. In this connection, document CD/482 of 26 March 1984 contains the proposal containing the scope of national verification, and the role, tasks and composition of the national team. In addition, document CD/613 of 10 June 1985 contains the proposal by which large-scale production facilities of the chemical industry should be subject to national verification measures. The aim of these inspection measures was to create confidence among the parties to the Convention, and to envisage, at this early stage of the negotiations, the conditions in which the highly complex tasks of the team of inspectors will be carried out. Today, many countries have already indicated by their measures of national trial inspection, the possible solutions and the problems resulting from such inspection. More than 20 countries have shown that the task is not an easy one, and that it requires a clear definition of the volume of the work to be done, the tasks of each member of the inspection team and the role of the facility representatives, which can be a very useful one in dealing with and defining complex operations. Finally, as it has been pointed out several times at the Conference, the purpose of such inspection is to create confidence among the parties to the Convention and to create pre-conditions for a multilateral inspection.

In view of the past experience of numerous delegations concerning the question of national trial inspection, we organized a routine inspection of a plant for the production of chemicals declared under Schedule (3) of the Annex to article VI of the draft convention.

1. OBJECTIVE

A national trial inspection was organized to test whether a facility is not used to produce any chemicals other than the declared ones, and whether the produced quantity is equal to the declared one.

2. COMPOSITION OF THE INSPECTION TEAM

- A representative of the Federal Secretariat for Foreign Affairs;
- A representative of the Federal Secretariat for National Defence;
- A representative of the Chamber of Economy of Yugoslavia, Secretariat for Chemical Industry;
- An analytical chemist from a research institute;
- A chemical engineer, doctor of chemistry from a research institute, member of the Yugoslav delegation in the CD.

3. DESCRIPTION OF FACILITY

The plant concerned is part of the PIB enterprise - Industry of Basic Chemistry, Baric, Beograd, intended for the production of toluene diisocyanate (TDI) and linear alkyl benzoates (LAB). The chemical which was the object of our inspection was phosgene, a Schedule (3) chemical. It is produced in a single-purpose reaction vessel (main reactor, fig. 1); there is also another smaller reactor for the finalization of the process (clean-up reactor, fig. 1).

The entire quantity of phosgene is utilized in the production of toluene diisocyanate (TDI). Presently, it is not envisaged for sale to other plants. (The plant is still in the stage of production preparation.) The continuous process of production was planned on the basis of the well-known Stauffer process; the raw materials are carbon monoxide and chlorine, and the catalyst is carbon. The phosgene output in this process is 92 per cent according to the project and the installed equipment. Carbon monoxide is produced in the plant (fig. 2.3), while chlorine is supplied from the HIP plant, Pancevo. For this purpose, containers for the storage of chlorine are provided for within the plant for complex (fig. 2.5). The plant does not produce other chemicals listed on the Schedule (3).

4. CONDUCT OF TRIAL INSPECTION

The visit to the plant included a meeting with the manager and engineers; the staff was informed about the purpose of the inspection. The Commission representatives familiarized themselves with the plant's production programme, and toured: the automatic control room (fig. 2.1), the phosgene production unit (fig. 2.2), the carbon monoxide production unit (fig. 2.3) and tanks for storing chlorine (fig. 2.5), the analytical laboratory (fig. 2.6) and the medical centre (fig. 2.7).

Figure 2 (Attachment 2) shows the layout of the plant's units. The members of the Commission also acquainted themselves with workers' protective and medical measures.

The plant's main product is toluene diisocyanate (TDI). The raw materials for this product are dinitrotoluene and phosgene. Dinitrotoluene is transformed into toluenediamine which reacts together with phosgene to produce TDI. Phosgene is produced according to the well-known process (Stauffer process) from carbon monoxide and chlorine, with carbon as catalyst. Carbon monoxide is produced from natural gas, while chlorine is purchased from the enterprise HIP, Pancevo. Chlorine is transported by tank-trucks.

The phosgene production unit is shown (diagram) on figure 1 (Attachment 1).

The members of the Commission were informed about the problems facing the plant at the earliest stage of production. Namely, the Commission's visit to the plant took place at a time when preparations for phosgene production were under way. Therefore, the entire facility was under the production régime, and all lines, vessels and automatic controls of the flow of raw materials and products were tested, including automatic control of technological parameters. It is envisaged that the whole process of phosgene production be carried out automatically and controlled from the room for the regulation of all parameters. The instruments for automatic process control can be sealed, whereby the process of control is verified, i.e. it is not possible to change the declared production.

All protective and medical measures applied in the course of production were discussed. To that effect, personal safety equipment for workers and inspectors was demonstrated.

Subsequently, a comparison was made with the parameters monitored in the reaction vessels, and associated pipework, storage tanks, etc. Within the plant there are steel tanks for both chlorine and phosgene. There is an empty tank for each respective chemical in case of emergency.

The Commission toured the facility and inspected all the ducts, measuring instruments, valves, reactors and distillation lines. It also acquainted itself with sample-taking procedures and the sites envisaged for taking samples.

In the analytical laboratory, the analytical methods and the sample-taking procedure were discussed. The Commission acquainted itself with the methods to be applied in sample analysis. The basic technique is gas-chromatography (GLC) for which the laboratory is equipped with sophisticated instruments. All the safety measures to be applied in the sample-taking procedure and preparation for analysis were also discussed. The inspectors were supplied with equipment for taking gas and liquid samples, and the existing plant equipment would also be used.

5. DOCUMENTATION

The inspector had an insight into the documentation concerning:

- the plant, location of facilities and tanks for storing raw materials;
- the layout diagram of the phosgene production unit of the PIB;
- the production plan;
- quantity and quality of the raw materials needed for phosgene and TDI production, and
- material balance related to the annual production of phosgene.

6. DURATION OF THE NATIONAL TRIAL INSPECTION

- A meeting of the inspection team before the on-site inspection.

- A meeting with the plant manager and engineers.

- On-site inspection (one day).

- A meeting of the inspection team after the on-site inspection.

7. CONCLUSIONS OF THE INSPECTION

The main conclusion of the inspectors on the basis of the information presented is that the facility corresponds to the standard facility for continuous production of phosgene. The capacity of the facility corresponds to the planned capacity. Within the plant grounds there are reservoirs for phosgene storage. The amount of phosgene stored in the reservoirs is used only to ensure the continuous process of TDI production.

A quantitative inspection of the process can be conducted on two bases: that of the automatic records of raw materials and products, and that of the inspection of technological parameters also automatically recorded.

Since specifically designed for the production of phosgene, the facility is not multi-purpose and it is, therefore, less doubtful whether such a facility can produce any other chemical either on list (3) or on lists (1) and (2).

8. EVALUATION OF THE INSPECTION

After the inspection several issues came up which should be underlined in order to have a quantitative evaluation of the verification results. Certain basic requirements have to be fulfilled for the inspection to be successful. It is necessary to:

(a) give a precise description of the location of the plant;

To avoid misunderstandings regarding the plant being the object of inspection within the enterprise complex, a layout of the facilities, together with the plant notification and the report of the Commission should be submitted. A summary of the processes and operations which can be carried out in the plant should be attached. Location information of the entire enterprise is also necessary.

(b) describe in detail the process of the synthesis of the chemical under inspection;

This will require the presentation of information on the material balance of the processes (input raw materials and output products), technological parameters and methods for quality control of raw materials and products. With the assistance of the plant personnel, methods of analyses, places and methods of sample-taking and all protective measures to be undertaken in the process of synthesis and in the case of analysis should be described.

(c) outline the problems occurring during the analysis of undeclared chemicals;

The inspection team is authorized not only to establish the declared production but also to find out whether any other chemical syntheses from listed Schedules (1), (2) and (3) can be made in declared facilities. For that kind of evaluation and analysis it is necessary to have a good knowledge or the principles of technological processes for the synthesis of other chemicals and of the special equipment required for the production of liquid and solid chemicals (reactor, distillation and crystallization vessels and equipment, measurement instruments, pipelines, etc.). Therefore, the inspection team should include chemical engineers, military experts, specialists in monitoring and measuring instruments and automation, and specialists in physical and chemical methods of analysis.

Furthermore, the inspection team should be equipped for taking samples directly from the reactors, air, soil and waste waters within the plant grounds or close to it. Extensive assistance of plant personnel is also expected in this context.

The ability and readiness of the facility for the synthesis of other chemicals is also established by inspecting the stocks of raw materials and reservoirs in the plant grounds.

All this indicates that it is essential to determine, during the negotiations at the Conference, the minimum data necessary to reduce doubts as much as possible about the possibilities for the violation of the Convention.

(d) reduce the possibility of any leakage of confidential commercial information;

As it was repeatedly pointed out during the negotiations, for the inspection to be successful it is necessary to take care of the protection of confidential information. Among them, commercial data and information on research and development work in an enterprise are considered to be the most sensitive. Therefore, it is necessary to determine and agree, in each particular case, which information represents a secret. This kind of information could possibly be given for inspection only to the leader of the team. Furthermore, it is necessary to determine the minimum information needed for the successful carrying out of the inspection. The minimum is determined during the process of inspection and with the assistance of the plant personnel, having in mind that the information given for inspection be sufficient for a realistic evaluation of the plant ability for declared chemicals production.

(e) limitation of the analyses of technological parameters;

Besides commercial information, information on the process of production can also be of a confidential nature. We consider that it should be of a less frequent case, but if it is necessary to classify some information as confidential, that has to be determined for each case separately. Regardless of all this, we consider that the leader of the team should also be given the above-mentioned information for inspection. The minimum of technological parameters for the successful conduct of the inspection is also determined with the assistance of the plant personnel.

(f) proposals of the standard form for data on the plant for the report;

Although it is clear that there are different plants and different processes of production of the same or similar chemicals, we consider that for a successful conduct of inspection it is necessary to propose a standard form both for submitting the applications regarding chemicals and facilities in the plant and for the report submitted to the inspection team.

In Attachments 4 and 5 we give some examples of these forms illustrated with details of the production of phosgene in the plant which was the object of inspection.

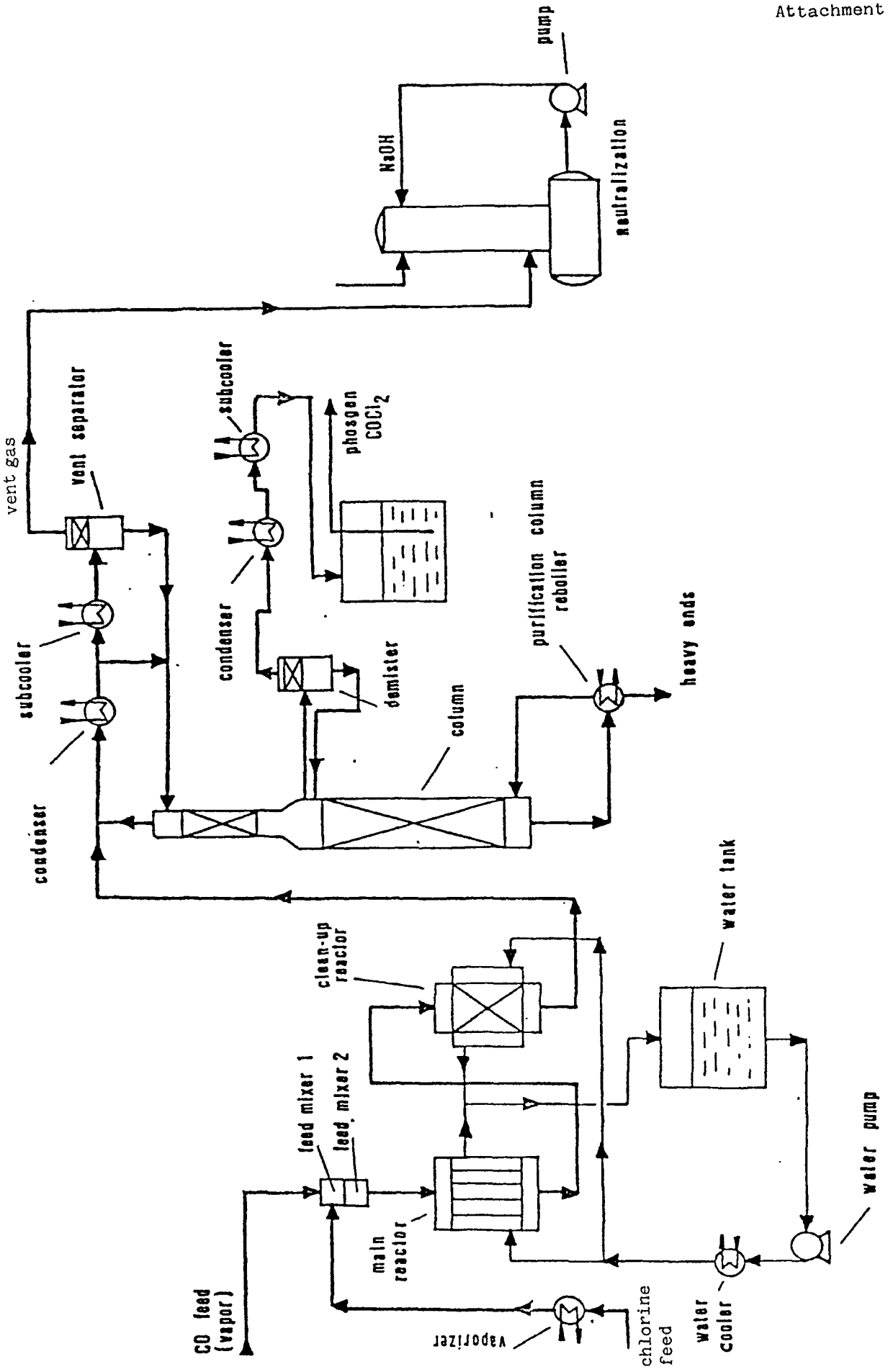
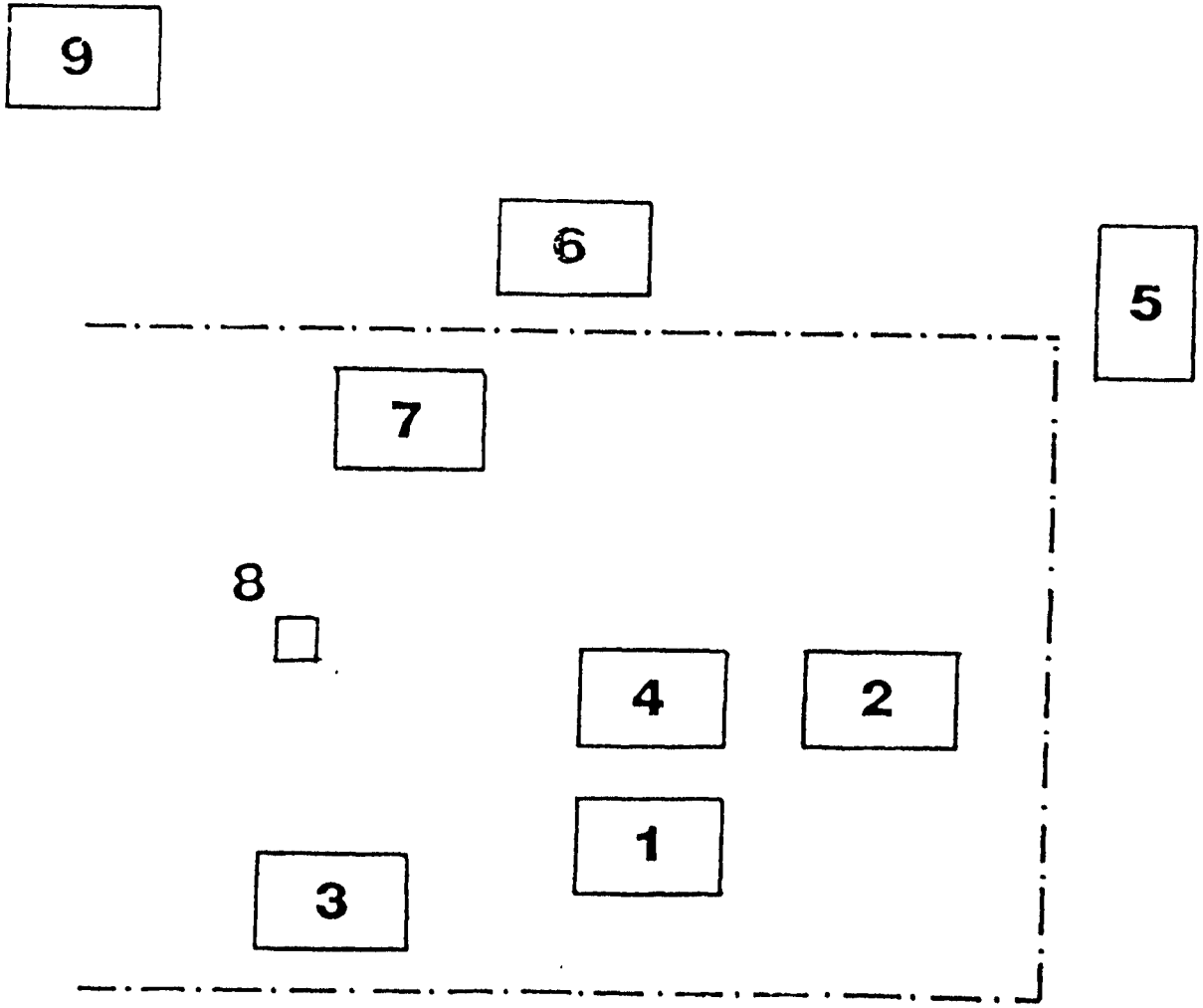


Figure 1. Process flow diagram for the production of phosgene



1. Automatic control room
2. Phosgene production
3. Carbon monoxide production
4. TDI production
5. Chlorine store
6. Analytical laboratory
7. Medical department
8. Incinerator
9. Waste water

Figure 2. Layout diagram of the phosgene production unit of the PIB - industry of basic chemistry

Attachment 3

Schedule 1. Material balance for the production of phosgene and TDI

	input (kg)	output (kg)
Carbon monoxide	402	-
Chlorine	947	-
Phosgene	-	1 290
Production TDI		
Phosgene	1 290	-
TDA *	710	-
TDI	-	1 000

* TDA - Toluenediamine

Attachment 4

DATA ON CHEMICAL - SUBJECT OF INSPECTION

1. Chemical name, common or trade name, structural formula and Chemical Abstract Service Registry No.:

   Phosgene, Carbonic dichloride, Carbonyl chloride, Chloroformyl chloride

   $COCl_2$ CAS 75-44-5

2. Total amount produced, consumed, imported, and exported

   (a) The facility which is the subject of inspection is in the stage of production preparation: the predicted installed production is

   25 800 t/y

   (b) Total amount to be produced in 1990 is around

   6 500 t/y

   (c) There will be no exports nor transfer to other domestic industry

3. Purposes for which chemical is produced

   (a) Processed into TDI

   (b) There will be no exports nor transfer to other domestic industry

   (c) There is no export

Attachment 5

DATA ON FACILITY - SUBJECT OF INSPECTION

1. Name of the facility and owner, company, or enterprises operating facility

   PIB - Industry of Basic Chemistry, BARIC-BEOGRAD

2. Exact location of the facility

   BARIC-BEOGRAD

3. Whether the facility is dedicated to produce or process the listed chemical or is multi-purpose:

   The facility is dedicated to produce only the listed chemical: Phosgene

4. Main orientation of the facility

   The main orientation of the facility is the production of phosgene and TDI

5. Whether the facility can readily be used to produce a schedule (1) chemical or schedule (2) chemicals

   The unit produces phosgene and cannot be readily used to produce any schedule (1) chemical or schedule (2) chemicals

6. Production capacity for the declared chemical(s)

   The total production capacity of the unit synthesizing phosgene is

   25 800 t/y

7. Which of the following activities are performed with regard to the chemicals?

   (a) Production of phosgene
   Phosgene 25 800 t/y

   (b) Processing with conversion into another chemical
   Phosgene is processed into TDI (20 000 t/y)

8. Whether at any time during the previous calendar year the declared chemical was stored

   The facility is on trial production

9. Are there any reservoirs for raw materials and which ones?

   (a) There are three steel reservoirs of 100 m^3 each of chlorine, one of them is always empty (emergency tank)

   (b) There are three reservoirs of 16 m^3 each for phosgene exclusively to assure the continuity of the production of TDI, one is always empty (emergency tank)

10. Technology employed

   (a) Interaction of chlorine with excess of carbon monoxide in the presence of carbon as catalyst

   (b) Pressure in the main reactor: 5 bars

   (c) Temperature in main reactor 70°C

11. What facilities are there for the conversion of waste gases and waters?

   (a) Waste gases: neutralization and incineration

   (b) Waste water neutralization
