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SAFETY PROCESS INDUSTRY
(Industrial Safety)

SAUDI ARABIA
(IS/SAU/73/003/11-02/01)

ind safety
1 p. ind

Final report prepared for the Government of
the Kingdom of Saudi Arabia

by

Antonius J. Veringa
UNIDO Expert

We regret that some of the pages in the microfiche copy of this report may not be up to the proper legibility standards even though the best possible copy was used for preparing the master fiche

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SUMMARY

A tour of PETROMIN's industrial establishments was arranged for the writer to evaluate the existing conditions concerning industrial safety and report the findings as well as make recommendations for future improvements.

The survey revealed a lack of adequate industrial safety measures and it is strongly recommended that PETROMIN initially engage consultants in this field and later form its own industrial safety department to remove the hazards (Ref. Appendix I).

INTRODUCTION

Through the intermediary of the United Nations Industrial Development Organization, the Kingdom of Saudi Arabia requested in 1973 assistance in preparing programmes of industrial safety for the industrial establishments of Petromin.

Petromin is a public organization set up by the Government of the Kingdom and is charged with the main responsibility of planning and implementing industries of a diversified nature based on oil, natural gas and minerals. At present the major industrial enterprises run by Petromin are: the Oil Refinery, Steel Rolling Mill and Petrolub plant, all in Jeddah; the Oil Refinery in Riyadh; the Fertilizer and Sulfuric Acid plant both at Dammam; and the storage facilities of Petromin Marketing at Dharan.

The terms of reference and objectives of the request were:

- a) study and evaluate the existing measures of industrial safety adopted by the industrial establishments of Petromin;
- b) formulate recommendations on the improvements to be made on the existing measures of industrial safety or on alternative measures to be introduced;
- c) preparing training programmes on industrial safety for Petromin's employees engaged in industrial safety.

REPORT PREPARED FOR PETROMIN

EXPLANATION

"Industrial Safety" in the process-industry takes into account the design and construction of chemical and other productive plants and process-units, thereby incorporating safety in every aspect of development and design stage such as: "selection, situation and layout of site", "reactions + process conditions", "storage + handling of dangerous substances", "methods of operation", "fire protection", etc.

Thus, Industrial Safety does start on the planning board. Industrial safety is different from "Occupational Safety" which proceeds from an existing situation and protects the worker in his working environment while he is doing his job. Examples of this type of safety are: "wearing goggles, masks, gloves and protective footwear where needed", "by taking preventive measures for people working at a certain height so that they will not fall", "making the worker aware what hazards there are" and such like.

Although Industrial Safety is different from Occupational Safety, both services are related, with the latter being a subsection of the former. It needs to be clearly understood that a well designed "industrially safe" plant will give far less occupational safety hazards than a badly designed one. As an analogy, whatever safetybelt is used, driving in a car without brakes is certain to be more dangerous than driving in a car with brakes. Occupational Safety without Industrial Safety will never ensure that the safest possible conditions prevail.

Whatever good intentions there may be, despite all measures taken, occurrences such as explosions cannot be entirely ruled out. Industrial Safety therefore goes even further. It not only tries to prevent calamities happening, but if an emergency does arise, for whatever reason, it will try to minimize the effects. For instance, storage of liquids with potential explosion hazards should be limited.

INTRODUCTION

It is because of the several severe industrial calamities that occurred in late years, resulting in loss of many lives, heavy loss of capital investment and tremendous costs involved to cope with matters like pollution, liabilities to third parties, etc., that in some countries in Europe, in recent years, Government bodies were formed to set standards of Industrial Safety.

The main task of these new bodies became to set basic safety rules for proposed new plants, in addition, to put forward recommendations as to those plants already in existence, and to advise on other safety matters tied in with and related to industry.

Rotterdam-Europoort-Botlek, the densely populated and highly industrialized (mainly petrochemical) area in Holland was one of the places in Europe where strict measures had to be taken, and where such a body was formed. Plants of many major firms are to be found there i.e. I.C.I., Shell, Gulf, Esso, etc. The possibility of special hazards had to be considered for Rotterdam having a large concentration of industry and being one of the largest ports in the world where the biggest tankers can enter.

To give an idea what "Industrial Safety" can be, a few present day topics in the Rotterdam-Europoort-Botlek area are given, which require careful deliberation:

(a) Cooled storage versus, the more dangerous considered pressure storage. When something happens to a tank a less hazardous boil-off is obtained instead of a flash-off.

(b) Nitrogen-blanketing. Gas explosions can be avoided by measures to prevent the occurrence of explosive concentrations, e.g. excluding oxygen by maintaining a blanket of inert gas (dosing with inert gas). However, nitrogen will also give maintenance hazards (death by asphyxiation) and hence will give rise to an "Occupational Safety" problem. The pros and cons in each case need to be considered separately.

(c) Floating-roof tanks versus cone-roof tanks. This is a topic touching economics (vapor pressures), pollution (breathing of tank if cone-roof is used), and occupational safety (control + maintenance).

(d) The production, storage and transport of Chlorine. Chlorine is particularly dangerous because of toxicity hazards.

(e) Safety-valves and breaking-plates. In itself industrial safeguards, the valves + plates should be placed where they themselves will not create "Occupational Safety" problems.

Early investigations made by the aforementioned bodies revealed:

(a) that the "Industrial Safety" of each plant differs, even if similar product(s) are being made;

(b) that the "Industrial Safety" in many cases had been initiated only by the contractor and to what extent had depended mainly on the integrity, experience and/or industrial capability of the contractor who had tendered for the project;

(c) that low tendering prices usually implies a low level of "Industrial Safety";

(d) that Government industry on the whole proved to be worse on "Industrial Safety" than private enterprise.

FINDINGS: After visiting Petromin's main office and visiting and reviewing Petromin's major enterprises, it is apparent there is no programme yet established, nor a department or body within Petromin available, or taking care of Petromin's own "Industrial Safety".

With Petromin being not much different from other companies, it is not surprising therefore, that in Saudi Arabia similar conditions were found to exist as had already been found in other countries.

The following findings, by far not exhaustive, are given solely with the purpose to prove, and to emphasize, the existing acute urgency that Petromin should give immediate attention and high priority to "Industrial Safety".

Safco Dammam:

1. Installation of tanks. Essential tanks never should be installed singly. At least one additional tank is always needed to allow for inspection and maintenance, to prevent unnecessary plant shutdown, to be used as a spare in case of emergency or calamity etc. Safco's liquid ammonia tank as well as the sulfuric acid tank, on the contrary, were found to be single installations.
2. The huge 10,000 ton liquid ammonia tank has no rampart around it. Ammonia-gas is highly dangerous because of deadly (toxic) concentrations it can form as well as explosive mixtures with air. Imagine what will happen if that tank goes! A concrete adjacent surrounding wall is badly needed, having a height more or less the same as the tank itself.
3. The same, as stated under 2, applies for the smaller 900 ton 98 % sulfuric acid tank. Although less elaborate it should never-the-less have been fitted with a surrounding wall. Sulfuric acid is highly corrosive and dangerous. 98 % has a carbonizing effect on the human skin.
4. Layout of plant. Safco's Urea-plant was built far too condensed. It for sure must have been competitive in price. Urea however is highly corrosive and maintenance can't keep up with the damage Urea does to the plant itself. The plant is dangerous and should have occupied a much larger site.

Petromin Marketing Dharan:

1. Proximity of fuel tanks. The 5000 bbls aviation gasoline tank was found to be very close to the control room and manifold system without any barrier between the two. The heart of a system should always be safeguarded.
2. The same applies for the other 10,000 bbls aviation gasoline tank being too close to the powerhouse. Also in this case no barrier was found to exist between the two.

Riyadh Refinery:

1. The 8 propane + butane spherical tanks are too close to each other and, moreover, instead of 8 together, two separate clusters of 4 each would have been advisable. Furthermore, the whole spherical tank farm in itself is too close to the adjacent floating roof gasoline storage.
2. The crude oil plant and the hydrogen plant are built too condensed (too compact), they resemble transistor boxes.
3. Overhead piperacks (over hazardous zones) as in the crude section area A and the isomer section area B should have been avoided.
4. Most oil trenches around the different plant sections are found to be far too close to the system itself (in some cases too close to heating system), not wide enough (clogging up can easily occur), and all were found open (all need to be covered up).
5. Nowhere a color indicating system for steam, gas, crude, etc. was found (ergonomics).
6. No tanks, (cone- as well as floating roof) were found to have a drainage to outside the embankment. At the moment draining is done within the embankment itself.
7. The major piping lanes were not found to be entrenched (and compartmented).
8. A lucid example that preventive "Industrial Safety" needs to be introduced was the explosion which recently occurred in the "main switch room". Gas (most likely butane, being heavy) infiltrated through duct(s) into the room from below and was ignited. An accident like this should never happen.

Jeddah Refinery:

1. As regards oil-trenches around the different plant sections, the same can be said as already stated under Riyadh Refinery point 4.

2. As in Riyadh (point 5) no color indicating system was encountered.
3. The FCC-unit is considered to be too compactly built (Riyadh point 2).
4. As in Riyadh (point 3) overhead piperacks over hazardous areas exist.
5. Most piping lanes were not found to be entrenched (and compartmented), (Riyadh point 7).
6. As to industrial safety, the old tankfarm is considered in bad shape and poorly organized. Criss-cross pipelines exist all over, no access roads for maintenance or fire-fighting are available, tanks are too close to each other, etc.,etc.
7. The old tankfarm has no drainage system (Riyadh point 6).
8. The tinfactory (open fire) on the refinery site, also being downwind from the loading area, is an indirect potential hazard to the refinery (it needs to be removed).
9. The refinery stacks are all too low, more so in view of the downwind adjacent steelmill (were people are working).
10. The steel-mill (open fire) is far too close, also being downwind from the refinery. It is an indirect potential hazard to the refinery.
11. The safety valves of the hydrogen-storage vessels (although hydrogen being very light) are considered situated too low.

Steel-Mill Jeddah:

1. Only one entrance exists. It forms a bottleneck.
2. The mill is hemmed in between Petromin's refinery and Petromin's lubricating Oil Company (Petro-lub) and is getting suffocated.
3. The mill is too close to the refinery (viz. Refinery Jeddah point 10).

Petro-lub Jeddah:

No striking matters on industrial safety were observed.

General:

1. Nowhere was it found that attention had been paid regarding layout to the prevailing wind direction.
2. Furthermore it was noticed that as to occupational safety, the set-up differs for each of Petromin's plants. Each one also being in a different stage of development
3. It was also noticed that so far Petromin has not been fortunate in securing, as to plant and plant-systems, the best obtainable on the market at the time of purchase.

RECOMMENDATIONS:

Immediately:-

(A) One of the things needing immediate attention are Petromin's expansions in the near future, takeovers and new building projects.

It is urgently needed to enlist a reliable consultant or firm on "Industrial Safety". The advice of this consultant on the one hand will co-decide the price in case of a take-over; on the other hand, regarding new projects or those already in the stage of being built, it will still be possible to make the necessary changes or supplementary measures (amplifications) in order to ensure adequate industrial safety for the future.

For the future:

(B) The advice regarding the future can only be that within Petromin an overall body, (organization, department), as soon as possible, ought to be formed which will take care of Petromin's "Industrial Safety". Within this context "Occupational Safety" will find its place.

The main tasks of this new body within Petromin are to be:

- (1) to advise management on all safety aspects "Industrial" as well as "Occupational";
- (2) to take care of what had, temporarily, to be given to the consultant firm (recommendation A);
- (3) to be responsible for "Industrial Safety" in existing Petromin plants;
- (4) to form a liaison between management and each of Petromin's enterprises in regard to "Safety" and to be the official spokesman of management on management's Safety policy;

Note: The new body should only act in an advisory capacity. Safety and Safety-policy must come from and be stimulated by the people at the top. The responsibility for this safety (industrial as well as occupational) therefore should, and can, only remain in the hands of

management.

- (5) to collect and to analyse accident data, (not necessarily those only relating to bodily harm), of the various Petromin's enterprises in connection with the safety policy to be undertaken by management;
- (6) to provide courses in Occupational Safety for all branches and personnel of Petromin;
- (7) with regards to safety, to keep track of new developments and methodologies;
- (8) to be the stepping stone as well as, the body which has to take care of such future items as environmental control and potential nuisance.

In this stage there is very little sense to start considering how the new body should look, how it needs to fit into Petromin's organization, the amount/caliber/training of people needed, etc. To a large extent it all depends on the policy Petromin decides to pursue and the decisions which Petromin intends to take.

One of management's philosophies could be that Petromin should fit a wider context. Industrial Safety is a national item. Next to Petromin there is also private enterprise. In case a national "Industrial Safety" body should arise, which with the rapidly expanding industry would be advisable, Petromin's set-up, although still needed, of course could be less elaborate as it would then comply with the new "national" body.

APPENDIX II

LIST OF CONTACTS

Riyadh: Agency for Technical Co-operation
Administration:
H.E. Mr. Abdul-Malek Othman Ferrash
Director General

Riyadh: Refinery:
Mr. Saud Al-Jauhar
General Manager Production

Riyadh: Petromin (Head Office):
H.E. Mr. Jamal Hasan Jawal
Deputy Director Petromin

Mr. Hussein A. Musleh
Manager of Technical Services

Mr. Sulaiman Al-Amri
Manager, Department of Training

Mr. Mohammed Mahmoud Khalil
Safety Officer

Mr. Abdulrahman A. Abdulkader
Manager Organization + Methods

Mr. Mansour M. Dehlavi
Assistant to Mr. Sulaiman Al-Amri

Jeddah: Petromin (Head Office):
Mr. Abdullah Gama
Public Relations Manager

Jeddah: Steel-Mills:
Mr. Fadhl Abdullah Ba-Paqih
General Manager

Jeddah: Refinery:
Mr. Fuad M. Bakheet
General Manager

Mr. Badesh
Production Manager

Mr. G.D. Miller
Chief Engineer

Jeddah: Petrolubi:
Mr. Abdullah Shalabi Owida
Technical Manager

Mr. S. Muktar Ahmed
Safety Director

Mr. Rashad A. Kayal
Administrative Manager

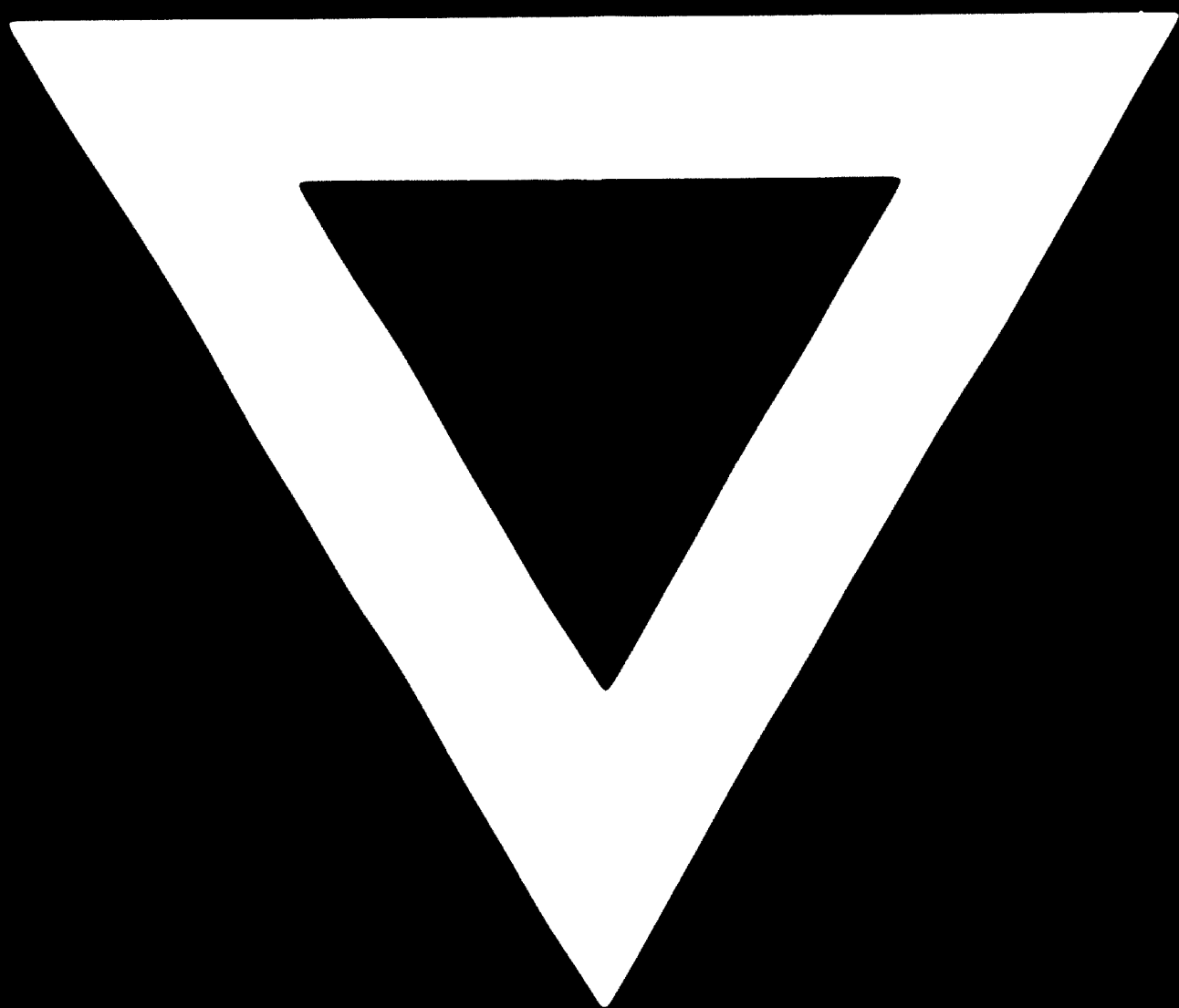
Dharam: Safoo:
Mr. M.S. Hashim
Public Relations Manager

Dharam: Petroin-Marketing:
Mr. Shehata Saeed Abu-al-Jada
General Manager

Mr. Dr. A. Qidwai
Works Manager

Mr. Saad Ahmed Al-Lohdan
Administrative Manager

Mr. Ijaz Ahmad
Safety Supervisor



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