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DEVELOPMENT OF SOFT DRINKS INDUSTRY

DP/YEM/74/016

YEMEN ARAB REPUBLIC

TERMINAL REPORT

Prepared for the Government
of the Yemen Arab Republic by the
United Nations Industrial Development Organization,
executing agency for the
United Nations Development Programme

United Nations Industrial Development Organization

10.76.0000

United Nations Development Programme

DEVELOPMENT OF SOFT DRINKS INDUSTRY
IS/YEM/74/016

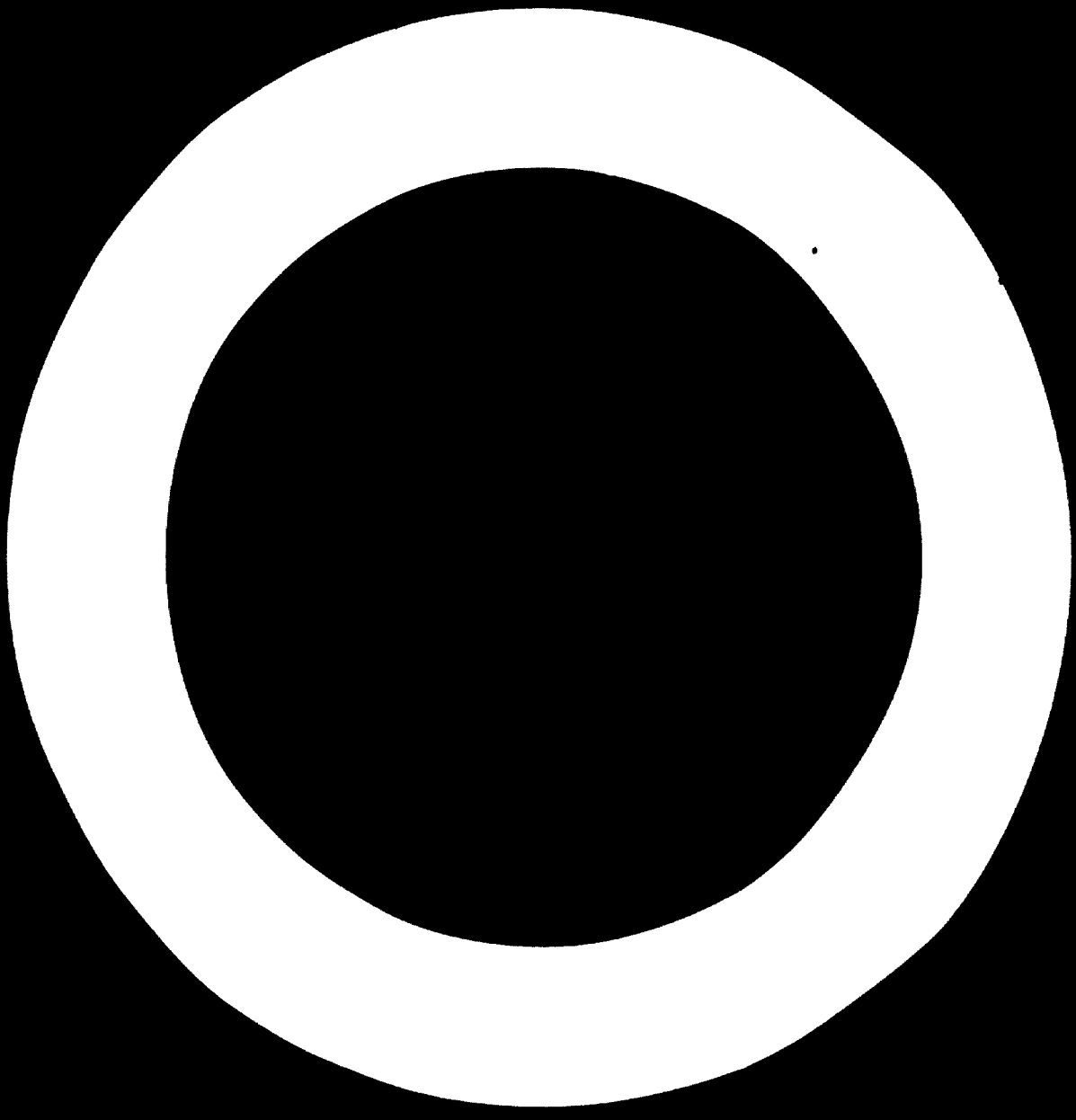
YEMEN ARAB REPUBLIC

Project findings and recommendations

Prepared for the Government of the Yemen Arab Republic
by the United Nations Industrial Development Organization,
executing agency for the United Nations Development Programme

Based on the work of Bernhard Hofherr, expert in production of soft drinks

United Nations Industrial Development Organization
Vienna, 1976



ABSTRACT

An expert in the production of soft drinks was sent to the Yemen Arab Republic on the project "Development of soft drinks industry" (IS/YEM/74/016) of the United Nations Development Programme (UNDP). The executing agency was United Nations Industrial Development Organization (UNIDO). The expert arrived in February 1976, and stayed in the country for three months. UNDP contributed $7,500 toward the project.

At present there are four units in the Yemen Arab Republic producing soft drinks. All four are privately owned. This industry plays a small but important part in the national economy. The Government is giving it much attention as it is also related to the nutrition and general health of the public. It was believed that the present production of soft drinks was not carried out according to the necessary hygienic standards. The government authorities, therefore, requested the services of an expert, for a period of three months, to undertake a detailed study of the production of soft drinks and make recommendations on the measures to be taken to ensure the most hygienic production of such drinks and work out a training programme for a selected number of employees in each unit.

The expert's assignment was to make an assessment of the existing soft drinks plants in the country particularly their cleanliness and hygienic conditions, and to advise in introducing measures to ensure the most hygienic production.

He reported that the plants were well organized and maintain a reasonably hygienic level of production. The licensors (Pepsi-Cola and Canada Dry) obviously impose a certain control of production and do not permit any change in the composition of syrups or in the production technology. The expert's tasks had therefore to be modified to a certain extent and he concentrated on supervising the production and maintaining hygienic standards as well as teaching the staff to better understand the requirements of the licensors.

Explanatory notes

References to dollars ($) are to United States dollars, unless otherwise stated.

References to tons are to metric tons, unless otherwise stated.

References to "gallons" are to the United States gallon; one United States gallon equals 3.785 litres.

Besides the common abbreviations, symbols and terms, the following have been used in this report:

1 acre	0.4 hectares
ppm	parts per million

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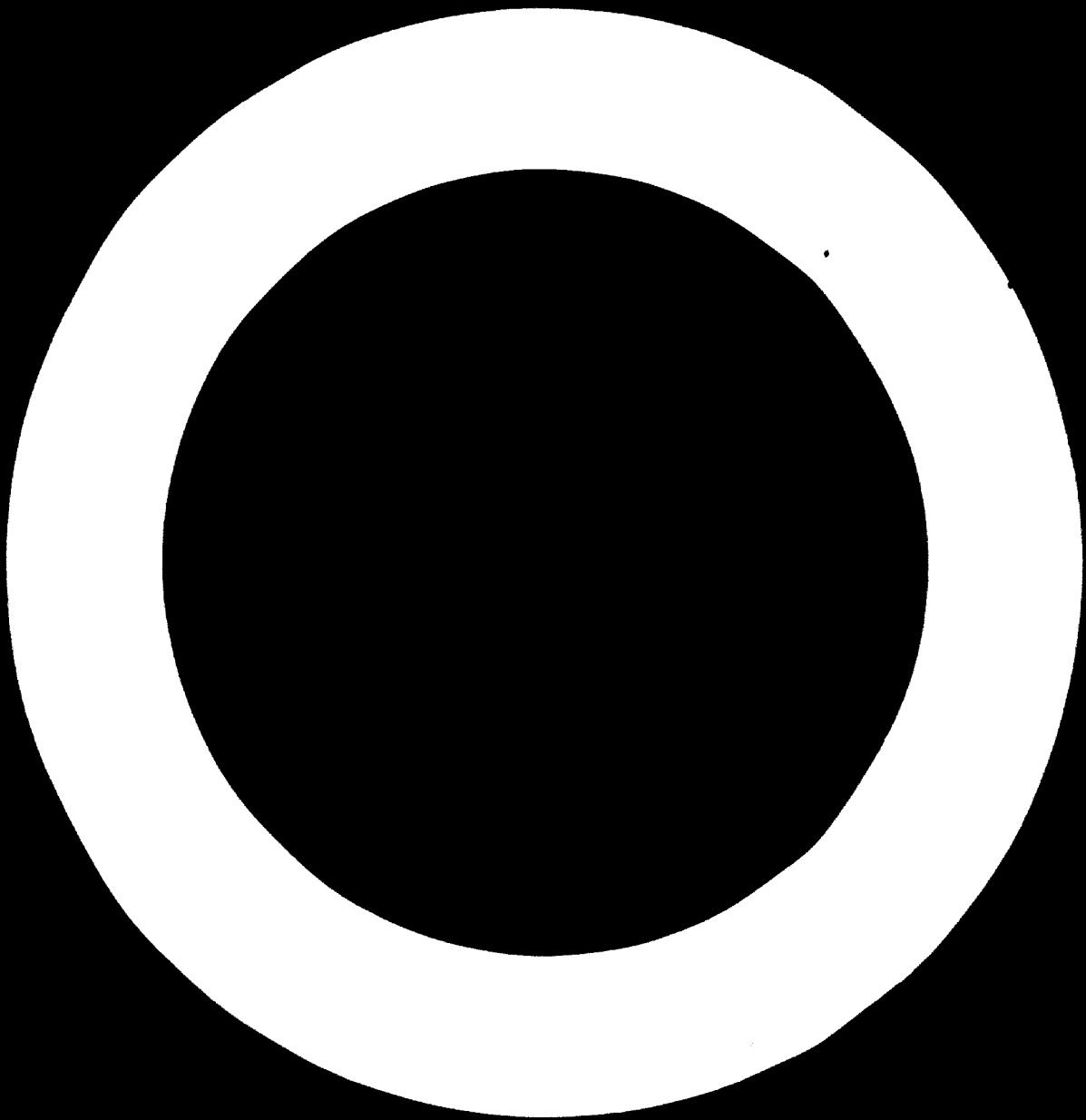


INTRODUCTION

The project "Development of soft drinks industry" (IS/YEM/74/016) of the United Nations Development Programme (UNDP) in the Yemen Arab Republic was carried out by an expert in the production of soft drinks from the United Nations Industrial Development Organization (UNIDO) which was the executing agency. The mission lasted three months, starting in February 1976. UNDP contributed $7,500 towards the project.

At present there are four units in the Yemen Arab Republic producing soft drinks. Two of these units are located in Taiz and the other two in Hodeida. All four units are privately owned. The soft drinks industry in the Yemen Arab Republic is one of the small but important general industries contributing to the national economy and providing employment.

The Government is giving this industry much attention as it is also related to the nutrition and general health of the public. It was believed that the present production of soft drinks was not carried out according to the necessary hygienic standards. The government authorities, therefore, requested the services of an expert, for a period of three months, to undertake a detailed study of the production of soft drinks and make recommendations on the measures to be taken to ensure the most hygienic production of such drinks and work out a training programme for a selected number of employees in each unit.

The expert's duties were to include:

1. The investigation of the present methods and techniques used in units producing soft drinks.

2. An examination of the raw materials, water and other inputs used in the production of soft drinks, and an investigation of the general production process.

3. A detailed study of the hygienic aspects of soft-drinks production in all existing units.

4. Detailed recommendations on the measures to be taken to ensure the most hygienic production of soft drinks.

5. Working out a training programme on the hygienic aspects of soft-drinks production for a selected number of employees in each unit.

6. Training counterpart personnel in the course of carrying out the duties specified above.

The expert's report indicated that the soft drinks production in the Yemen Arab Republic is well organized and maintains a reasonably hygienic level of production. The licensors (Pepsi-Cola and Canada Dry) obviously impose a certain control of production and do not permit any change in the composition of syrups or in the production technology. The expert's tasks had therefore to be modified to a certain extent and he concentrated on supervising the production and teaching the staff to maintain hygienic standards.

FINDINGS

A. The soft drinks industry in Yemen

The Pepsi-Cola plant

The Pepsi-Cola plant at Hodeida is situated at the town boundary on the highway to San'a'. In 1970 the plant was equipped with British machines. The technical standard is on an international level. The equipment is as follows: Meier Dumore bottle-washer, Mojonnier carbo-cooler-premixer, bottle-filler, crown-corker, and the necessary conveyors. The capacity of the plant is about 500 dozen bottles/h. All equipment is in one building containing a warehouse for empty bottles, full bottles and stores; water treatment and chlorination; syrup production; and offices.

The plant has its own well but this water is highly saline, approximately 1,000 ppm chloride. For this reason it is only used, after treatment, for bottle washing and cleaning. Water for syrup production is brought by container car, three loads and more a day, from a well at km 16 of the highway to San'a'. It is less saline, 550 ppm chloride, than the plant's water, and so can be treated and chlorinated more effectively. This water is used for syrup production, bottling, and also for the boiler.

The Pepsi-Cola plant is working under licence from the Pepsi-Cola International Company and is subject to its strict regulations concerning water treatment and chlorination, and water used for syrup production and bottling. The bottling plant has been operating only a few years; the equipment is in good condition and, as far as possible, is maintained locally.

It is a handicap that there are not enough bottles. The truck that brings empty bottles has to wait until these are refilled which causes a great loss of time. With a sufficient number of bottles, equipment and manpower could be better utilized.

The climate - sand-storms and heat - causes the machinery to wear out quickly as fine sand enters the plant. The only remedy is to clean the walls, floors, and equipment constantly and far more often than has been the case.

It is planned to provide the plant with fork-lift trucks and pallets in order to save time in loading and unloading and to facilitate heavy work.

Cases and bottles form unstable stacks so pallets with railings and rubber bolts are recommended, otherwise, the stack of pallets might fall apart. Good pavement and sufficient space for the pallet trucks is required and the store must be orderly. As fairly new machinery is in operation, a good cooling system is provided. Since the beverage can absorb more CO_2 at low than at high temperatures, it is recommended to cool the last rinsing water of the washer in order to avoid foaming and CO_2 liberation during bottling. Preventive maintenance, i.e. greasing, oiling, and minor repairs of the machinery, is carried out as far as possible by experienced staff, which is locally available.

The Canada Dry plant

The Canada Dry plant is working under licence from Canada Dry Worldwide Inc. in Beirut. Samples of all beverages produced - Canada Dry Orange, Hi-Spot Lemon and Canada Dry Cola - are sent monthly to the above licenser who sends a controller to Yemen every three months. The plant is situated at km 45 of the Hodeida-San'a' Highway. It has its own well operated by an Italian model pump with a 20 hp diesel engine. Thus water can be obtained after the diesel generators are stopped at the end of working hours. Water for syrup production and bottling is chlorinated, treated, and filtered. Current is provided by two diesel generators: one a British model, the other a Mann-AEG from the Federal Republic of Germany. The bottle washer and premixer-intermixer-dosing bottling equipment which were put into operation two years ago are from Orthmann & Herbst, in the Federal Republic of Germany. The capacity of the plant is about 1,100 dozen bottles/h, but it can be operated at a lesser capacity.

The plant is modern and well equipped. It has pallets and two fork-lift trucks and meets the hygienic and technical requirements concerning high carbonization, suitable bottle cleaning, cooling and filling. A steam generator, whose steam is automatically generated at the required level, is provided to heat the bottle washer and to heat water for cleaning purposes. CO_2 is provided by the CO_2 Factory at km 16 of the Hodeida-San'a' Highway. Pallets are used and as previously explained, the store must be orderly. Trained and experienced staff is available for machine operation and maintenance. The expert considers it disadvantageous that the duties of a production manager are divided among several persons. The Canada Dry plant conforms to modern standards.

This plant had a problem with the lye used in the bottle washer. As the lye drained away it caused damage outside the plant. The expert recommended suitable means to neutralize the lye with acids before draining.

The Industrial Soft Drinks Bottling Co. Ltd.

This company, which produces Stem-Orange Drink, Super Orange, Super Fruit (lemonade essence), Super Lemon (lemon drink) and Super Cola, is situated on the Hodeida Highway about 5 km from the town boundary of Taiz. The beverages are sold throughout Yemen.

Water is taken from the public water supply and treated and chlorinated. Possible reserves are stored. In the case of increased demand, it is brought to the plant by container car. There is a project afoot to exploit and use ground water, together with the hospital, at a distance of about 1.5 km from the bottling plant. CO_2 is provided by the CO_2 Factory at Hodeida, as for the two bottling plants previously mentioned. The "Super" drinks plant is not connected with any licenser, however, strict orders exist regarding the production of beverages, syrup, filling etc. Samples are controlled by an institute for beverage production. The production manager is well qualified to meet the company's requirements.

The British machinery of the entire bottling plant is very modern so that beverages of a good quality and high carbonization can be produced, e.g. Cola drink of 4.6 volumes of CO_2 (a standard Pepsi-Cola is 3.7) and Super Orange of 3.0 volumes of CO_2 (a standard orange drink is 2.8).

Trained staff is available for water treatment and chlorination, bottling syrup and maintenance. A project is planned to erect a large bottling plant on the area (one hectare) behind the factory, and to equip it with pallets.

On the whole, it can be said that the soft drinks industry in the Yemen is provided with modern equipment, qualified chief personnel and a staff experienced in production and maintenance.

The CO_2 Factory

The CO_2 Factory is equipped with modern machinery and is large enough to allow an increased production of CO_2 as doubling can be achieved by two shifts. Extension possibilities exist.

B. Methods and techniques

The methods and techniques presently used in the soft drinks industry are as follows:

1. Prepare a syrup of a solution of sugar, add concentrates, essential oils, flavours and preservatives, and use a prepared and chlorinated water according to the recipes of the licensing firms. The Industrial Soft Drinks Bottling Company in Taiz must work to the same specification as these firms, as it is not possible to sell a beverage of lower quality. For the production of syrup in the three factories all parts in contact with water, carbonized water and prepared beverages are of stainless steel, e.g. containers, pumps, tubes, carbo cooler, premixer, sugar filter, filler and filler valves. This facilitates cleaning and disinfection. In the production of Mirinda, the orange beverage of the Pepsi-Cola factory, 47.27 kg of sugar are dissolved in 96 gal of treated and chlorinated water. These two ingredients give 170 gal of plain syrup which is agitated and filtered through special filter sheets. Then is added: (a) 1 unit of Mirinda concentrate, and (b) 1 unit of acidulant with citric acid, and sodium benzoate as a preservative.

The mixture is topped up with prepared water to 180 gal which, well-agitated, ready syrup fills 1,136 dozen bottles.

2. Prepared and chlorinated water is cooled and carbonized in the carbo cooler, then mixed in the premixer with syrup, filled in bottles and sealed with crown corks.

3. Water preparation and chlorination is of great importance.

The procedure of water treatment in the Super factory at Taiz, is based on the following raw water analysis:

TDS (total dry substance)	2,800	ppm	as	$CaCO_3$
pH	7.5	"	"	"
EMA	1,283	"	"	"
Alkalinity	430	"	"	"
CO_2	30	"	"	"
Sulphate	563	"	"	"
Chloride	240	"	"	"
Nitrate	80	"	"	"
Calcium	420	"	"	"

Magnesium	364	ppm	as	$CaCO_3$
Total iron	05	"	"	"
Iron in solution	05	"	"	"

The anticipated quality of the water from this treatment plant is:

pH	7.5	ppm	as	$CaCO_3$
Alkalinity	32	"	"	"
Chloride	64	"	"	"
Calcium	1	"	"	"
Magnesium	1	"	"	"
Sulphate	23	"	"	"

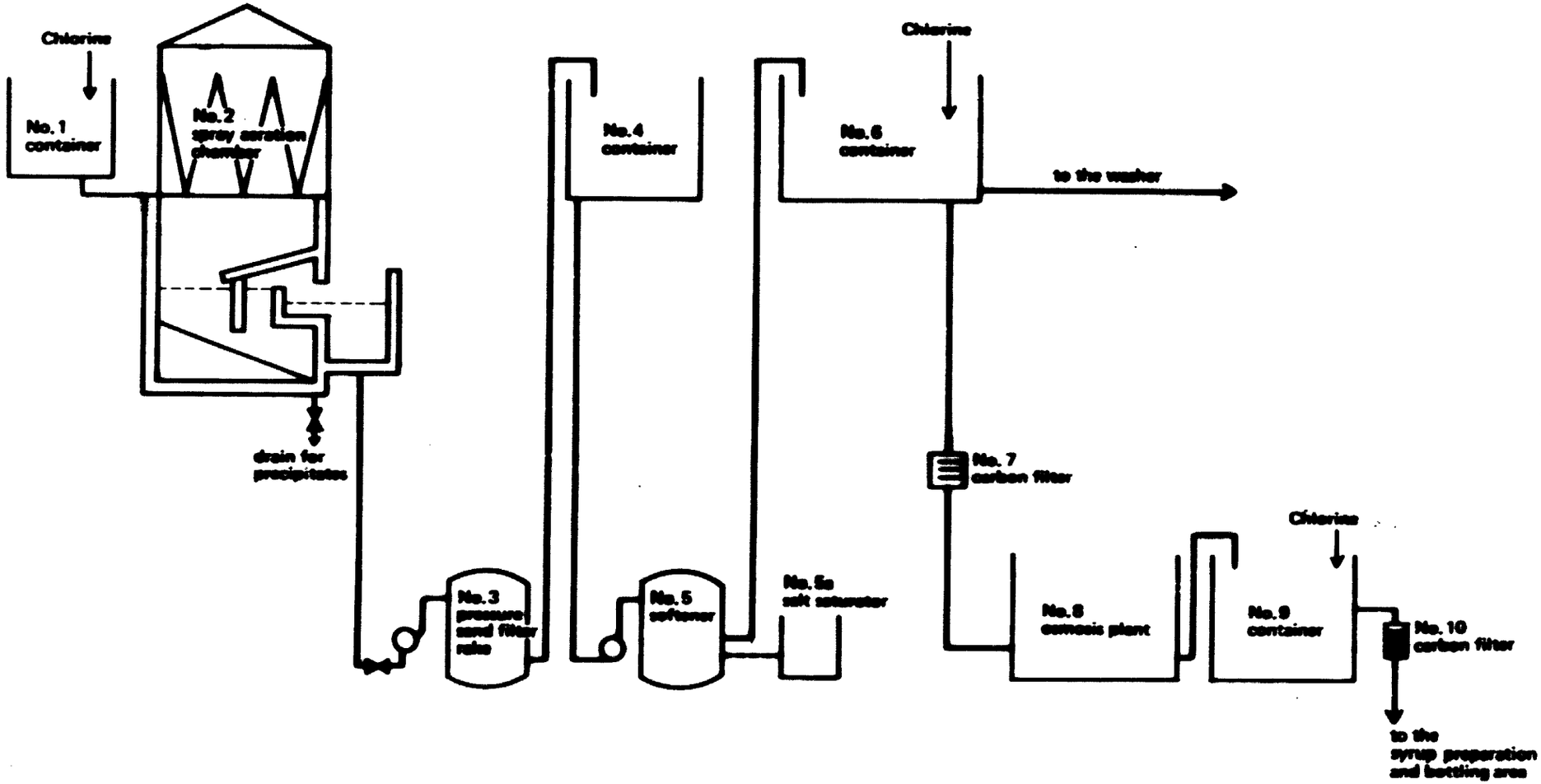
Water treatment

Water is collected in a container (see No.1 in the figure) and hypochlorite is added according to the quantity of water. It is then pumped to the spray aeration chamber (see No.2 in the figure) to remove the iron. The bottom of the tank under the spray aeration chamber is sloped to drain out all the precipitates. From here the water is pumped to the pressure sand filter rake (see No.3 in the figure) and the magnesium bed which absorbs residual iron and retains it in the sand bed. The water is then collected in a tank (see No.4 in the figure) and pumped to the softener (see No.5 in the figure).

The water softener

Softening is effected by ion exchange. During operation of the softener, hard water flows downwards through the ion-exchange material and salts of calcium and magnesium, which cause hard water, are exchanged for harmless sodium salts. This process continues until the material is exhausted and must be regenerated. Regeneration is easily carried out and consists of flushing the material with a solution of common salt to replace sodium on the resins. The calcium and magnesium salts taken up from the resins are expelled by rinsing the material with a flow of water. A water meter is supplied so that regeneration can be carried out after the softening of 40 m^3 of water.

Water from the softener is collected in a tank (see No.6 in the figure) where hypochlorite is added. This water is used in the bottle washer. For the production of syrup and for carbonized water, the same water from the tank passes to a carbon filter (see No.7 in the figure) and then to the osmosis plant (see No.8 in the figure) for removal of the dissolved salts.



Water treatment and chlorination

The osmosis plant

When a pressure in exoess of the natural osmosis pressure is applied to a solution in contaot with a semi-permeable membrane, pure water will flow through the membrane. This phenomenon is called reverse osmosis.

As well as retaining dissolved salts, a reverse osmosis membrane also aots as a molecular filter, and is capable of retaining bacteria and most organio materials found in natural waters.

The process is oontinuous, without the need for regeneration, and separates the feed water within the permeators into two streams, pure water and a reject stream oontaining the conoentrated salts.

The equipment consists essentially of a high pressure pump, the membrane permeators, and a reject flow oontrol devioe.

After osmosis, the water is oolleoted in a oontainer (see No.9 in the figure) where hypochlorite is added, then it is passed through a second carbon filter (see No.10 in the figure). This water is used for production of syrup and bottle filling. Attention should be paid to the fact that the water is ohlorinated three times.

This water treatment is very modern and efficient and is used in all three bottling plants.

C. Quality control

Raw materials

Sugar is imported from China. It appears good and seems to meet interna-tional standards but may be infeoted with organisms. The only way these can be deteoted is by laboratory testing. The taste, colour and odour of the oonoentrates, flavours and preservatives are normal.

It may be advisable to test orown oorks with a speoial gauge. This is an important daily oheok. All orown oorks are lined with plastio which is more hygienio than pressoork. They must seal well in order not to lose CO_2 under high pressure when the temperature rises. It may be feasible to use a speoial gauge bottle to oheok the pressure of the press oylinders. That the orown oorks are well sealed and the press oylinders apply the necessary pressure oan be oheoked by using the pasteurizing test. From each press oylinder a sealed bottle is taken, put upright in a water bath and heated to 58°C. The bottles, inoluding the orowns, must be under water. If bubbles

escape from the crowns, than either the pressure from the pressure cylinders is inadequate, or the crowns are not sealing well. From time to time a special controller should be used to check the purity of the CO_2 by detecting the absence of air.

Bottle washer

1. To determine the concentration of soda in the various containers should be determined by titration.

2. Temperature, level of soda solution and level of water should be controlled.

3. The temperature of the last rinsing water is generally very high, 33°C, which causes over-foaming and loss of CO_2. It is therefore recommended to cool the last rinsing water. However, a light overfoaming of the bottle before sealing is advisable in order to remove the air from the bottle neck.

4. The last rinsing water should be checked for the absence of alkalinity by testing with phenolphthalein.

5. Empty, and full bottles should be inspected visually.

It is recommended that 20-30 ppm tetrapyrophosphate be added to the last water tank. This maintains Mg ions and Ca ions in a complex substance and keeps the water soft.

Syrup preparation

The syrup must be prepared exactly according to the recipes of the licence firms. The weight of sugar must be exact and the quantity of water must be measured by a flow meter. The quantities of essences, flavours and preservatives must be exactly as in the recipes.

Syrup quality control

To test the quality of the syrup beverage treated, non-carbonized, water should be prepared in the laboratory. The quantity of the syrup should equal that used in a 250 cc bottle. the brix can be measured by hydrometer. The density, odour, colour and taste of this beverage may then be checked.

Control of prepared beverages

Taste, odour and colour must be normal. Brix (sugar %) must be standard. Volume of CO_2 is:

Cola drinks	3.7
Orange "	2.8
Lemon "	4.0

Generally, the gasification with CO_2 is higher than the standard. This is advisable because the bottle neck is then filled with the inert gas CO_2 which helps to avoid contamination by micro-organisms. The CO_2 tester is used daily in every factory (see annex).

Shelf life control

Two bottles should be taken from every batch produced and kept at the normal temperature. Every day they should be checked; if the bottle becomes cloudy, there will be precipitations on the bottom. The shelf life is the number of days before the cloudiness or precipitations begin. Generally the beverage is sold and consumed quickly. The orange from the Super factory at Taiz has a shelf life of several months before white precipitations appear on the bottom of the bottles. This is proof of the plant's high standard of hygiene.

Treated water control

Treated water must be checked chemically:

1. Titrate the hardness.

2. Titrate the alkalinity.

3. Titrate the chlorides.

4. Check the absence of chlorine in the water used for syrup production and check the carbonized water with ortho-tolidine.

Tests numbers 1, 2 and 4 are made every day; number 3, from time to time.

The necessary laboratory instruments are available. The following supplier may provide additional equipment:

Institut für Gärungsgewerbe
Seestr. 13,
Berlin N 65, Federal Republic of Germany

D. Hygiene

Soft drinks production is a food industry and the beverages produced are destined for human consumption. Therefore, the conditions of production must be as clean and hygienic as possible.

Every three months the Government examines the chlorination of the water wells at the factories. It also examines the workers occupied directly in the production of the beverages.

The workers in water treatment and chlorination, syrup production and bottle filling, are all examined to ascertain that they have clean hands, short nails, good health and no tuberculosis. In the Pepsi-Cola factory the workers in the filling room have special work clothes provided by the factory. Chlorine powder is used to clean the floor in the syrup preparation and bottling area and insecticides are used against flies. On entering this area the smell of chlorine powder is noted and the general aspect is clean.

Rubbish must be removed every day. This service could be improved.

In the Pepsi-Cola factory, the beverage Teem is bottled periodically, on a limited scale. One bottling of Teem is for sales of three months and therefore it must have a long shelf life. One hygienic measure is to wash the bottles twice, and this is done.

All the soft drinks plants use crown corks with a plastic lining. This is another sound hygienic measure as such crowns, unlike cork-lined crowns, prevent contamination of the beverage.

In order that the bottles go clean and practically sterile to the filler, it is important that the water in the bottle washer is of a high temperature and has a high content of sodium hydroxide (caustic soda). The last rinsing of the bottles should be with clean treated water which, from time to time, should contain 150 ppm chlorine solution. After this the chlorine must be removed by rinsing with clear water. (Absence of chlorine is checked by the ortho-tolidine test).

In the syrup room containers, pumps, tubes and a sugar filter of stainless steel are used, which is conducive to hygiene.

Every time a container is empty, it must be cleaned with a 4% solution of trisodium phosphate, as must tubes and pumps. This solution removes films of essential oils, which may cause oxidation resulting in a bad smell and taste in the beverages.

After this, the equipment should be given a good rinse with clean treated water, then a rinse with a solution of 150 ppm chlorine followed by a third, thorough, rinsing with clear water. Absence of chlorine must be checked by the ortho-tolidine test. The sugar filter must be cleaned with a 4% trisodium phosphate solution and renewed with special filter sheets. Also, the floors and walls of the syrup room should be given a good cleaning with chlorine powder. Generally, these measures are taken in the factories. It is very important to pay close attention to the afore-mentioned measures.

Cleaning and sanitation of the carbo cooler, premixer and filler

Every day when the bottling is finished, it is necessary to clean fully the containers, tubes to the carbo cooler, premixer and filler. The exterior of the filler andfiller valves are cleaned with brushes and a mild detergent solution, then they are rinsed with fresh water. Water is run into the filler bowl until it overflows into the filler valves. The filler valves are then closed and, again, clear water is run into the filler bowl. The water must be allowed to flow until the outlet valve, at the top of the bowl, is running clear. The outlet valve is then closed and the bowl filled with clear water which must be discharged by the filler valves, moved manually, until the water runs out of the valves.

Once a week, after the daily cleaning is completed, a 150 ppm solution of chlorine must be pumped continuously, for 40-60 minutes, through the system. At the end of this time, the concentration of chlorine should be 25 ppm. If it is less, more chlorine must be added until the residual chlorine is more than 25 ppm. It is important to rinse with clear water until all the chlorine is removed. Its absence should be checked by an ortho-tolidine test.

It is recommended that, four times a year, the filler bowl and all the filler valves be disassembled, cleaned with brushes and a mild detergent solution, and thoroughly rinsedwith clear water, then with a 150 ppm chlorine

solution, and again with clear water till all the chlorine is removed. This should be checked by an ortho-tolidine test.

Cleaning of the water treatment equipment

The most important measure in the water treatment is to add chlorine to kill all the organisms. This is done in all the factories. Also important is to clean the brushes from time to time and add fresh water to the different containers.

Every two weeks the permeators in the osmosis plant must be treated with a 4% hexametaphosphate solution.

E. Training programme

The programme is designed to train specialized workers to run all machinery in a bottling plant. It is necessary that workers be trained to execute all duties as a factory needs sufficient trained personnel to allow for absences or substitution or to run two shifts.

The bottle washer

Daily maintenance: oiling, greasing, maintaining the necessary caustic soda contents in the washing machines, about 3-4% (the standard in Europe is 2.5%) control by titrating the caustic soda solution; to add soda when the soda content is low; to keep the necessary temperature of soda solution in the three containers at 45°, 60° and 70°C, and to keep up the necessary level; to control the jets if there is enough pressure, and change the damaged jets and rubbers for new ones; and to check the last rinsing water for absence of soda by the phenolphthalein test, which must be negative.

Weekly maintenance: throw out the soda solution from all containers of the bottle washer, clean the mud and broken glass from the bottom and refill with a new soda solution of 4%; control by titrating.

Infrequent maintenance: clean the scale from the bottle-pocket chain by hydrochloric acid. This should be done from time to time, depending upon the accumulation of scale. To do this, the containers of the bottle washer are filled with very diluted hydrochloric acid, the bottle-pocket chain is loosened and moved through the acid till the scale is removed. Then the containers are washed again and again with fresh water until all the acid is removed. The bottle washer can then be started again with an addition of soda.

Water treatment and chlorination

Put hypochlorite in tank (see No.1 in the figure) according to the quantity of water and reception of container car. In the spray aeration chamber (see No.2 in the figure). Every two months spray nozzles, drain precipitates and the tank - the latter with brushes and clear water - should be cleaned. The pressure sand filter rake (see No.3 in the figure) should be cleaned every two weeks.

The softener (see No.5 in the figure) should be regenerated after softening 40 m^3 of water with saturated salt solution. The salt container should be cleaned with brushes and clear water, and a new salt solution prepared.

Put hypochlorite in the tank (see No.6 in the figure) according to the quantity of water. This water can now be used for the bottle washer. Water for syrup production and bottling goes from the tank (see No.6 in the figure) to the first carbon filter (see No.7 in the figure). After the carbon filter, check the absence of chlorine by the ortho-tolidine test.

Renovate the carbon in the carbon filter once a year. Every two weeks clean the osmosis membrane in the osmosis plant (see No.8 in the figure) with sodium hexametaphosphate. Clean the containers (see Nos. 1, 2, 4, 6 and 9 in the figure) every three month with brushes and clear water.

Titrate the treated water every day for hardness and alkalinity and occasionally for chloride. Every day, check the absence of chlorine with ortho-tolidine.

The syrup room

Workers are trained to prepare the different syrups by weighing the exact amount of sugar, and adding the exact amount of water (using a water meter); to maintain the time of agitation and blending; to filter the plain syrup, add the concentrates and the different preservatives; how to measure the brix (percentage of sugar in the syrup); to clean the sugar filter and change the special filter sheets; to clean and disinfect the floor with chlorine powder or hypochlorite; to clean the containers and tubes with brushes, a mild detergent solution and rinsing with clean water; to pump the ready syrup to the carbo cooler, premixer and filler; to clean and desinfect

the syrup room at the end of the bottling; to clean the washer every week by pumping a 4% trisodium phosphate solution through it, rinse with water, pump a 150 ppm chlorine solution through to disinfect it, rinse with clear water and check the absence of chlorine by the ortho-tolidine test.

Premixer, carbo cooler, bottle filler and crown corker

Workers are trained that before bottling they should grease and oil gears, air cylinders, and press cylinders then rinse with clear water. They should supervise the filler and crown corker during the bottling; maintain the temperature as low as possible; maintain the necessary pressure in the premixer, carbo cooler and filler; control the content of CO_2 with a tester; execute the cleaning and brushing of the filler; disinfect the equipment with a 150 ppm chlorine solution and rinse with clear water; and check the absence of chlorine by the ortho-tolidine test.

Theory

(a) Water treatment and chlorination;

(b) Prinoiples of syrup preparation;

(c) Bottling, carbonization and cooling;

(d) Raw materials required and quality control;

(e) Basics of chemistry, necessary titrations and the determination by a colorimeter of the chlorine content in the solutions.

Annex

CONTROL LABORATORY REPORT

Plant Name : MOBILDAN Date February 14,1975

The samples received from your plant under date 10/2/75 were examined by our Control Laboratory and the following are the results :

Product	Size	General and Physical Test: Sugar Brix STD.	Sugar Brix ACT.	Sugar Brix DIFF.	Gas Volume STD.	Gas Volume ACT.	Gas Volume DIFF.	Taste O.K. OFF	Color O.K. OFF	Filling O.K. HIGH LOW	Crown O.K. POOR DIFT	Appear. GOOD FAIR POOR	Bacteriological Analysis: Malt Agar O.K.	Malt Agar Yeast	Malt Agar Mold	Malt Agar Bac.	Nutrient Agar O.K.	Nutrient Agar Yeast	Nutrient Agar Mold	Nutrient Agar Bac.
Orange	2½	12.7	12.1	-.6	3.6	3.1	-.1	OK.	OK.	OK.	Dift	Fair	X				X			
Cola	25	11.0	10.7	-.3	4.0	4.9	+.9	OK.	OK.	OK.	Dift	Fair	X				X			
MI-SPOT	25	10.5	10.2	-.3	3.5	3.5	0	OK.	OK.	OK.	Dift	Fair	X				X			
K. CHAMP.	25	12.0	11.7	-.3	3.5	3.5	0	OK.	OK.	OK.	Dift	Fair	X				X			

REMARKS :

- The Gas volume of the Cola (4.9) is too high, must be reduced to Standard.

- Plain Crowns are not acceptable, use Crowns with Canada Dry Print.

	SCORE B	G.	BAC.
Orange	3	3	3
COLA	2	0	4
MI-SPOT	2	4	3
K. CHAMP	2	4	3

CANADA DRY WORLDWIDE INC.

[redacted]

By : A. S. Batri

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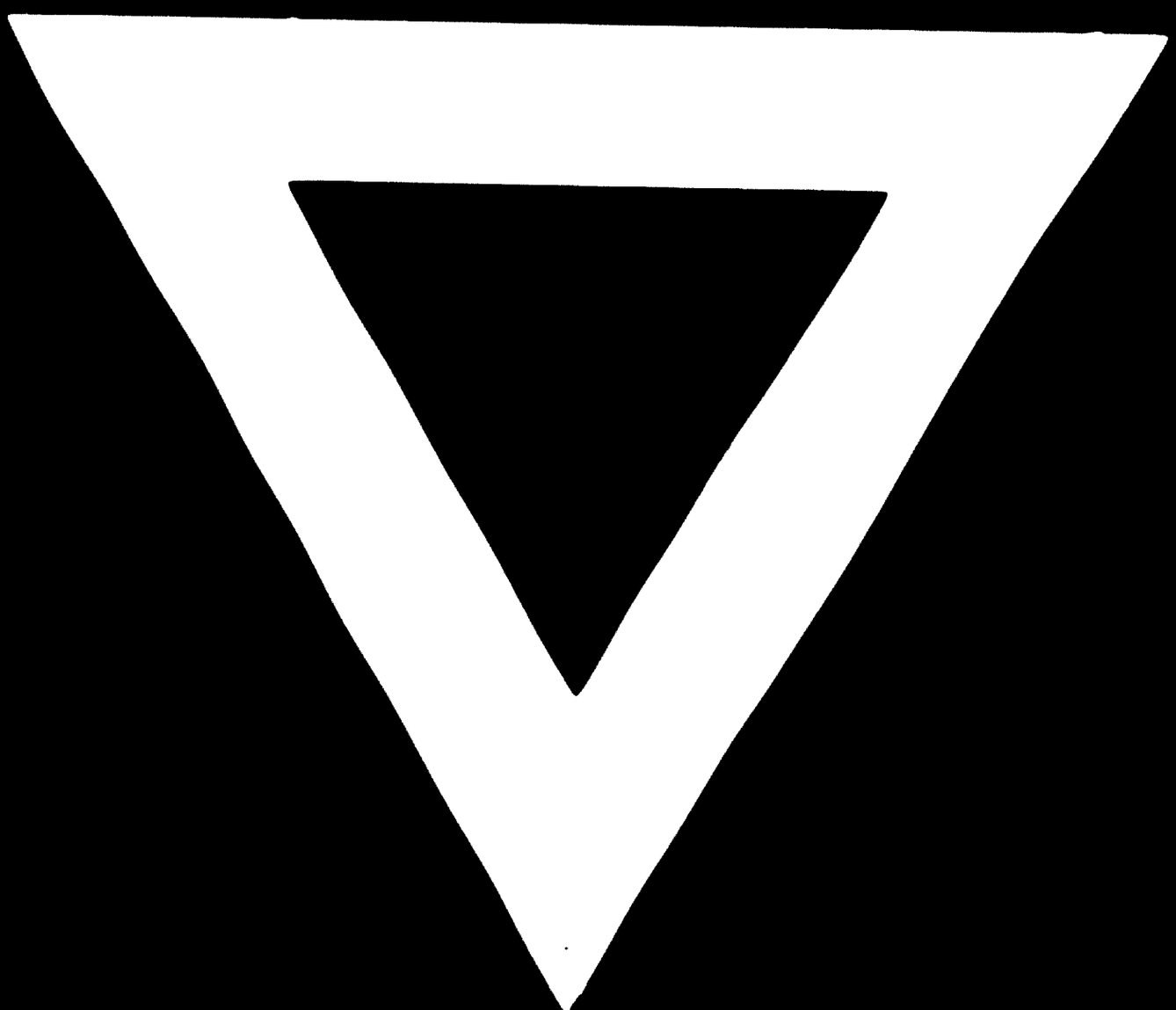

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