Egyptian Environmental Affairs Agency (EEAA)

Egyptian Pollution Abatement Project (EPAP)

Inspection Manual

Confectionary Industry

April 2002

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1. Introduction

The Egyptian Pollution Abatement Project (EPAP) sponsored by FINIDA has assigned Finish and Egyptian consultants for the task of developing Sector specific inspection and monitoring guidelines. This task is based on a previous collaboration between FINIDA and EPAP that resulted in the development of four Inspection Guidelines:

- Fundamentals and Background Manual that provides basic information about air pollution, wastewater characteristics, solid waste, hazardous materials and wastes and work environment.
- Guidelines for Inspectorate Management that discusses the strategy, objectives and tasks of the inspectorate management.
- Guidelines for Team Leaders that identifies the team leader responsibilities and tasks.
- Guidelines for Inspectors that presents a methodology for performing all types of inspection. Tasks during the various phases of planning, performing field inspection, report preparation and follow-up are discussed. Several checklists are included.

The three guidelines were later summarized into one that will be referred to as the Inspection Guidelines. A General Inspection Manual, GIM EPAP 2002, is being developed covering aspects common to all sectors.

On the other hand, a Self-Monitoring manual was also developed to present the industrial community and government officials with the general principles, both managerial and technical, to be followed for self-monitoring. The textile industry was chosen as a case study for implementing and testing the manual and a self-monitoring manual for this industry was developed.

1.1 Preface

The developed manuals were tested through a number of training programs that targeted RBOs and EMUs. The inspectors involved in the training used these manuals to inspect a number of industrial facilities. Feedback from the concerned parties led to the improvement of these manuals and their continuous update. There was clearly a need for sector-specific guidelines and EPAP took the initiative to develop such manuals. Five sectors were chosen:

- Food Industry with specific reference to the five sub-sectors of Dairy products, Vegetables and Fruit processing, Grain Milling, Carbonated Beverages and Confectionery.
- Pulp and Paper Industry
- Metallurgical Industry with specific reference to the two sub-sectors of Iron and Steel and Aluminum
- Engineering Industry
- Textile Industry.

1.1.1 Project Objectives

The project aims at the development of sector-specific guidelines for inspection and monitoring to be used by inspectors and plant personnel respectively. These manuals are meant to be simplified but without abstention of any information necessary to the targeted users. Flowcharts, tables and highlighted notes are used for easy representation of information.

With respect to the food industry, each sub-sector will have two distinct manuals one for inspection and the other for self-monitoring. Description of the industry, pollution aspects and relevant environmental laws will be similar for both manuals. Each manual will be, as much as possible a stand-alone with occasional cross-reference to the General Guidelines previously developed to avoid undue repetitions.

1.1.2 Organization of the Inspection Manual

The inspection manual for the confectionery industry includes ten chapters. The first chapter represents an introduction to the whole project and to the specific sub-sector of the industry. Chapters two to five deal with the confectionery industry and its environmental impacts.

The description of the industry in chapter 2 includes the inputs and outputs, a description of the different production lines with their specific inputs and outputs, a brief description of the service and auxiliary units that could be present at the industrial establishment with their potential sources of pollution and the various emissions, effluents and solid wastes generated from the different processes.

Chapter three describes the environmental and health impacts of the various pollutants whereas chapter four gives a summary of the articles in the Egyptian environmental laws relevant to the confectionery industry. Chapter five gives examples of pollution abatement techniques and measures applicable to the confectionery industry.

The inspection procedures are described in chapters 6 to 10 starting with a brief description of the inspection process in chapter 6 then the planning aspects that should be considered at the inspectorate level are explained in chapter 7. The different tasks at the inspectors level specific to the confectionery industry will be described in chapters 8 to 10. The tasks before field inspection are presented in chapter 8 whereas the inspection tasks for actually performing the field visit are defined in chapter 9. Chapter 10 is concerned with the conclusion of the field visit including inspection report writing, supporting the enforcement case and following-up the compliance status of the facility.

1.2 Introduction to the Confectionery Industry

The industry is a major enterprise in Egypt, occupying a significant place in food supply. The effluents from this industry contribute to the pollution of waterways especially when large industrial establishments are involved.

1.2.1 Egyptian SIC Code for the Confectionery Industry

The Standard Industrial Classification (SIC) code for the food industry is 15 and the confectionery industry as well as the fruit and vegetable processing industries are part of sub-sector 154, which includes other food industries as well.

The CAPMAS (Central Agency for Public Mobilization and Statistics) 1997 data, which is based on the 1996 census, shows that the total number of facilities is 18842.

1.2.2 Industry Size and Geographic Distribution

Table (1) presents a classification of the facilities by manpower for Egypt. Manpower is an indicator for the facility size, although modern facilities employ fewer workers for the same production rate. It is clear from the table that 94% of the facilities are operating with less than10 workers and 0.9% have more than 40 employees. Table (2) shows the distribution of facilities by manpower for each governorate.

Table (1) Size Distribution of Facilities in of Sub-Sector 154

Manpower	1	2	3	4	5	6-10	11-15	16-20	21-25	26-30	31-40	41-50	51-100	101-500	501-1000
No of facilities	1516	1631	2128	2491	8430	1554	492	183	97	98	39	85	72	11	15

Table (2) Size Distribution of Industries Included In Sub-Sector 154 Per Governorate

Manpower	Cairo	Alexandria	PortSaid	Suez	Damieta	Daqahlya	Sharkia	Qalyoubia	Kafr-el-sheik	Gharbiya	Menoufia	Behera	Ismalia	Giza	Benisuef	Fayoum	Minia	Asyout	Sohag	Qena	Aswan	Luxor	RedSea	NewValley	Matrouh	N.Sinai	SSinai	*Total*
001	283	251	16	6	48	118	77	65	41	61	46	65	25	156	36	26	72	36	28	25	15	5	4		5	4	2	1516
002	298	285	23	18	63	118	109	81	27	84	46	71	16	154	31	21	43	45	23	16	24	8	10		10	3	4	1631
003	359	291	20	24	53	139	159	104	62	143	71	84	34	214	37	24	69	58	49	55	35	7	8	2	19	5	3	2128
004	339	319	20	34	70	152	184	165	65	156	77	107	47	269	45	47	82	77	95	66	28	10	7	1	15	12	2	2491
005	1315	934	53	98	192	391	476	684	191	432	340	280	147	789	161	220	625	325	299	220	107	35	36	19	22	26	13	8430
010	397	120	20	14	25	57	79	97	26	97	41	31	18	171	28	54	95	36	41	65	19	3	8	3	3	1	5	1554
015	173	32	11	4	3	17	29	23	4	25	9	7	11	56	16	8	31	11	6	5	7	3		1				492
020	47	19	1	2	1	8	14	3		6	5	5	3	22	15	5	15	3	2	3	3	1						183
025	23	9	2	1	2	6	5	6	1	2		2	1	15	6		11	1	2	2								97
030	21	13	2	1		5	7	4	1	1	3	2	2	16	1	2	7	1	5	2	2							98
040	11	8			1	1	1			3	2	1	1	5	2				1		1			1				39
050	14	12	3		2	2	10	4		5	1	2	1	14		1	2		3	2	7							85
100	9	13	2			1	15	4		1	3	2	3	13		2			2		2							72
500	3	2					3							3														11
1000		4							1					1			1		1	5	2							15
Total	3292	2312	173	202	460	1015	1168	1240	419	1016	644	659	309	1898	378	410	1053	593	557	466	252	72	73	27	74	51	29	**18842**

2. Description of the Industry

The confectionery industry is characterized by the multitude of products and therefore production lines. Plants can have as few as one or two production lines or all of them.
Service and ancillary units provide water and energy requirements as well as maintenance, storage, packaging, testing and analysis needs. Because of the nature of confectionery industry, equipment is characterized by designs, which facilitate hygienic operation, easy cleaning and sterilization. While many older plants use manual methods batch processing, modern facilities are automated and operate in a continuous mode. Shut down for cleaning is generally required at least once per day.

2.1 Raw Materials, Products and Utilities.

The main ***raw materials*** used are sugar, flour, cocoa, butter, powdered milk, oil, molasses, glucose, yeast, ammonium bicarbonate, sodium bicarbonate, dates, raisins, nuts, artificial flavors, Gutta-Percha, lecithin, …

Chemicals are consumed at the facility for different purposes:

- In the lab for quality control and effluent analyses, such as organic solvents (ether, chloroform, acetone, toluene, hexane, ethyl and methyl alcohol's), acids (acetic, boric, oxalic, benzoic, hydrochloric, sulfuric), alkalis (sodium, potassium and ammonium hydroxides), potassium chloride, sodium sulfate, potassium iodide, culture media for microbial growth.
- For pH control such as dilute hydrochloric acid, sodium hydroxide
- As detergents and antiseptics for cleaning and sterilization (sodium hydroxide, nitric acid, sodium hypochlorite).

Lube oil is used in the garage and workshops.
Different types of ***packaging materials*** are also used (aluminum foil, plastic containers, tin sheets).
Steam is generated in boilers that use either mazot (fuel oil), solar (gas oil) or natural gas as fuel. Steam is used for providing heat requirements and in some large facilities for electric power generations.
Water is used as process water, as rinse water for equipment and floor, as boiler feed water, as cooling water and for domestic purposes. Boiler grade water is pretreated in softeners to prevent scale formation. Water may be supplied from public water lines, wells or canals. The type of water supply will dictate the type of pretreatment.

Big facilities can also include a housing complex generating domestic wastewater.

Note: Defining the inputs and outputs helps predict the expected pollutants.

2.2 Production Lines

Table (3) presents the various production lines and service units that could be present in a facility.

Note: Knowledge of the processes involved in each production line and units allows the prediction of pollution hazards and expected violations and helps determine possibilities for implementing cleaner technology.

Table (3) Production Lines and Service Units in Confectionery Industry

Production Lines	Service Units
Chocolate production line	Boilers
Powdered chocolate drink production line	Cooling towers
Biscuits production line	Refrigerators
Wafers production line	Laboratory
Bread and cake production line	Mechanical & electrical workshops
Corn flakes production line	Garage
Toffee production line	Storage facilities.
Halawa and tahini production line	Wastewater Treatment Plant
Chewing gum production line	Restaurant and Housing complex.

2.2.1 Chocolate and Powdered Chocolate Drink Production Lines:

Fig (1) presents the main operations in the production line, the inputs to the units and the pollution sources. Although the production line appears to be simple, in practise the process of producing high quality chocolate is quite complex. It requires the implementation of sophisticated process control. The main processes are:

Extraction of cocoa beans

Cocoa beans are first washed with water then roasted. The wash water from this step will be contaminated with dust particles. Electric furnaces are usually used for roasting and could be responsible for violating the workplace limits for heat.

A crusher is then used to disintegrate the cocoa beans and separate the shell from the seed, which is de-germinated to give the cocoa nib. Winnowing is performed to separate the nib from the shells. The crushing operation can cause air pollution due to particulate matter. The limits for workplace air quality as well as noise could be exceeded. The particulate matter settling on the floor will contaminate the floor rinse-water with suspended solids and organic material.

Grinding and pressing

The cocoa nibs are then introduced to a mill where they are reduced to a powder, which is fed to a press that extracts cocoa butter mechanically. Losses of cocoa powder as particulate matter in air and butter spills can cause high BOD load in the floor and equipment rinse water. Cocoa powder can impact workplace air quality.

Production of powdered chocolate drink

The produced cocoa is mixed with sugar and fed to a grinder for further refining. The powder is fed to the hopper of a packaging machine that fills it into boxes or cans. Air pollution can be expected unless proper containment and recycling of cocoa powder is performed.

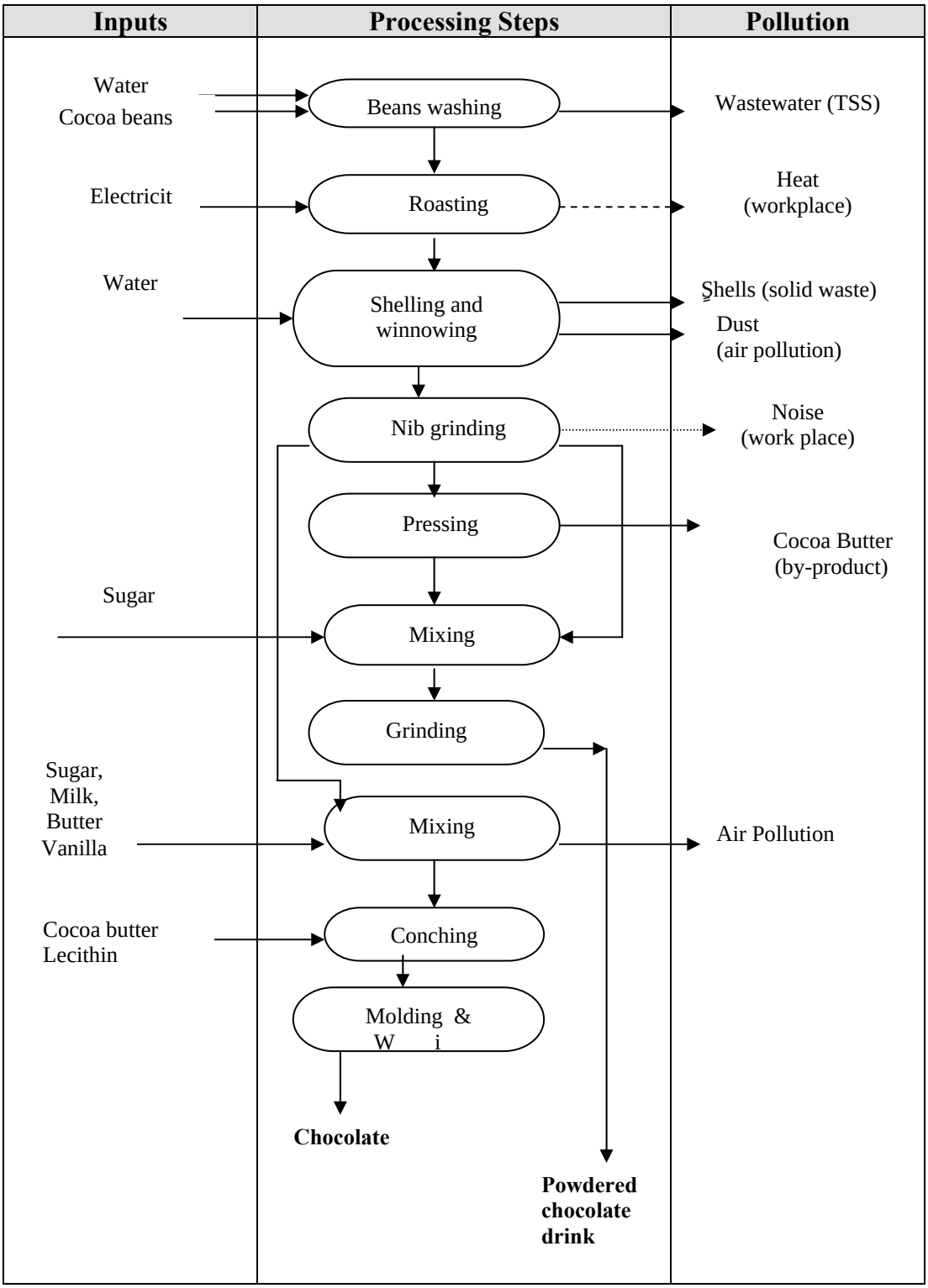
Production of chocolate

The produced cocoa powder is mixed with butter, lecithin, sugar milk, and vanilla. The produced chocolate paste is further ground (refined), conched and stored in heated tanks. Different types of chocolate are produced depending on the percentage of added ingredients. The chocolate is then poured into molds, cooled and wrapped.

Note: Find out:

- If grain wash-water is re-circulated.
- When does equipment and floor washing occur, at the end of the shift? Or at the end of the day?
- What type of detergent and/or antiseptic is used for equipment/floor washing?
- Is cocoa dust settling on the floor, washed to the gutters?
- Is cooling water for the chocolate molds, recycled through cooling towers?

Fig (1) Production line for Chocolate & Powdered Chocolate Drink and Related Pollution



2.2.2 Biscuits Production Line

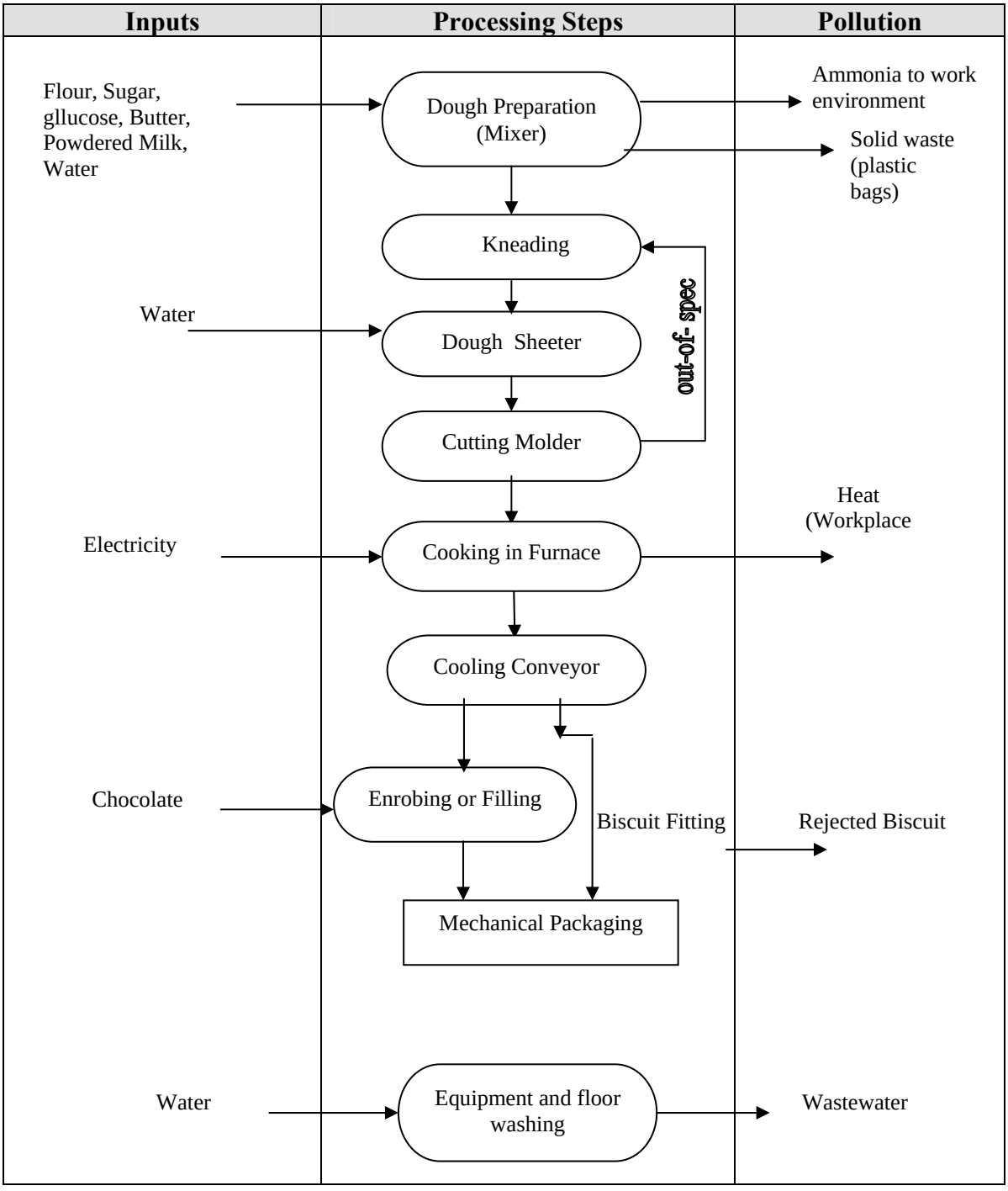
Fig (2) presents the main operations in the production line, the inputs to the units and the pollution sources. The main processes are:

Dough preparation	Sieved flour, fat, sugar and powdered milk are weighed and fed to the kneading machine. Additives such as ammonium and sodium bicarbonates, vanilla and flavors are also added. The dough is then fed between the cylinders of a dough-thinning machine (pre-sheeter). The product is transported on a belt conveyor to a cutting machine that cuts it into the required shapes. Out-of-spec dough is recycled to the kneading machine. Ammonia is emitted in the work place due to the usage of ammonium bicarbonate. Therefore, efficient suction and ventilation are required in this production line.
Cooking	The same belt conveyor introduces the cut dough in a tunnel oven (usually electric). Workplace temperature limit could be violated. Fans are usually used for cooling the cooked biscuits, which are then stacked manually or by machine. Broken biscuits are discarded as solid waste.
Packaging and storing	The biscuits are packaged as such, or coated with chocolate (enrobing), or filled with cream of different flavors. Large facilities usually use packaging machines, while in small facilities this step is performed manually. Product rejects result in solid waste.

Note : The sources of pollution are:

- Air pollution from flour particles in the sieving and mixing steps.
- Waste water from equipment and floor washing.
- Solid waste from out-of-spec biscuits and returned unsold biscuits.
- Temperature and noise in the workplace

Fig (2) Production line for Biscuits and Related Pollution Sources



2.2.3 Wafer Production Line

Fig (3) presents the main operations in the production line, the inputs to the units and the pollution sources. The main processes are:

Inputs preparation Sieved flour, sugar, powdered milk, sodium bicarbonate and water are weighed, then transported to the mixing section.

Dough and Filling preparation The weighed raw materials are mixed in a stainless steel mixer. The produced dough is thin and is pumped to feeding tanks that introduce the dough into wafer molds.
The filling cream is prepared by mixing sugar, fat, starch, powdered milk, and flavors in a jacketed vessel cooled with water.
The main potential sources of pollution are:

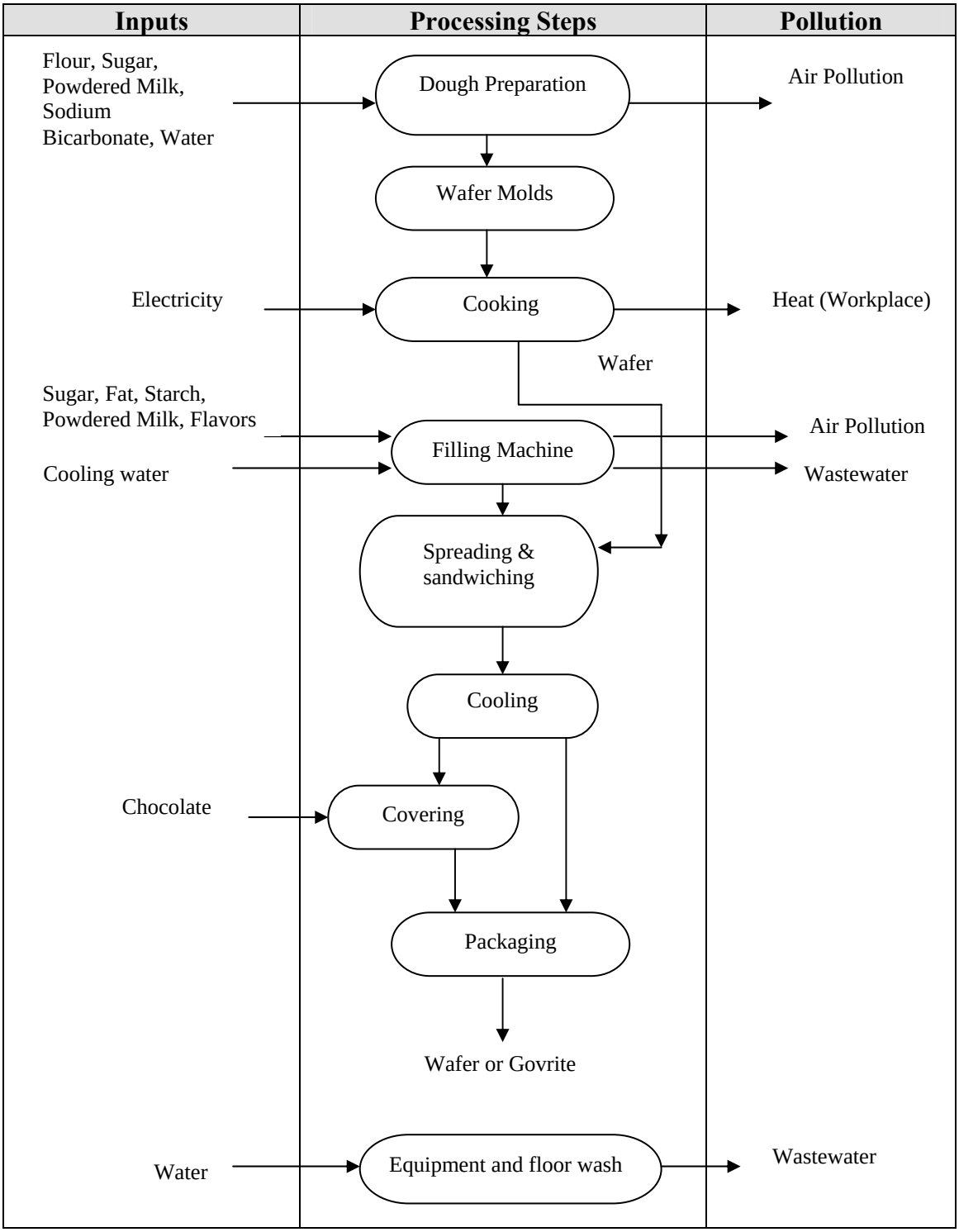
- loss of dough through spills and leaks
- dumping the remaining unused filling in the sewer
- equipment and floor wash

Wafer cooking The moulds containing the dough are heated in an electric oven. When cooking is complete, the mold opens automatically and the wafer sheet is ejected from the mold by an air jet coming through the mold.
The wafer sheets are cooled during their transportation by belt conveyors to the filling machine.

Filling and packaging The belt conveyor carrying the wafer sheets passes underneath the feeding hopper containing the filling cream. A thin layer of cream is spread on the sheet and a second sheet is placed automatically on top of the cream. The filled sheets are introduced into a tunnel, where they are cooled with an air stream.
Cutting saws cut the sheets into pieces that are automatically wrapped as such or fed to a chocolate coating machine where they are coated, cooled and wrapped.
Noise and temperature can exceed workplace limits. Solid waste resulting from product loss is a major cause for concern for this production line

Note:
Find out what happens to broken wafers and out-of-spec products.

Fig (3) Production line for Wafer and Related Pollution



2.2.4 Halawa and Tahini Production Line

Fig (4) presents the main processes in the production line, the inputs to the units and the pollution sources.

Preparation of sesame seeds

Sieves are used to separate dust particles from sesame seeds. A controlled water addition provides the necessary moisture content that facilitates peeling of the seeds. Separation of the peels is performed in a roller mill, where the cylinders squeeze and crush the seeds. A centrifuge is then used to obtain the clean seeds.

The seeds are then fed to a jacketed vessel heated by steam where they are roasted. Cooling occurs during the transportation of the seeds by belt conveyors, to the storage tanks.

The centrifuge can be a source of air pollution and heat and noise are expected. Sesame losses during transportation and the separated peels constitute the solid waste generated from these steps.

Preparation of tahini

Sesame seeds are ground in mills with the addition of water. Tahini is produced, filled in plastic containers either manually (in small plants) or mechanically (in larger plants).

Floor and equipment wash water will be contaminated with tahini spills occurring during the filling operation.

Preparation of molasses or syrup

If halawa is being produced molasses or syrup are added to the tahini. The syrup is prepared by mixing several ingredients according to the type of halawa produced.

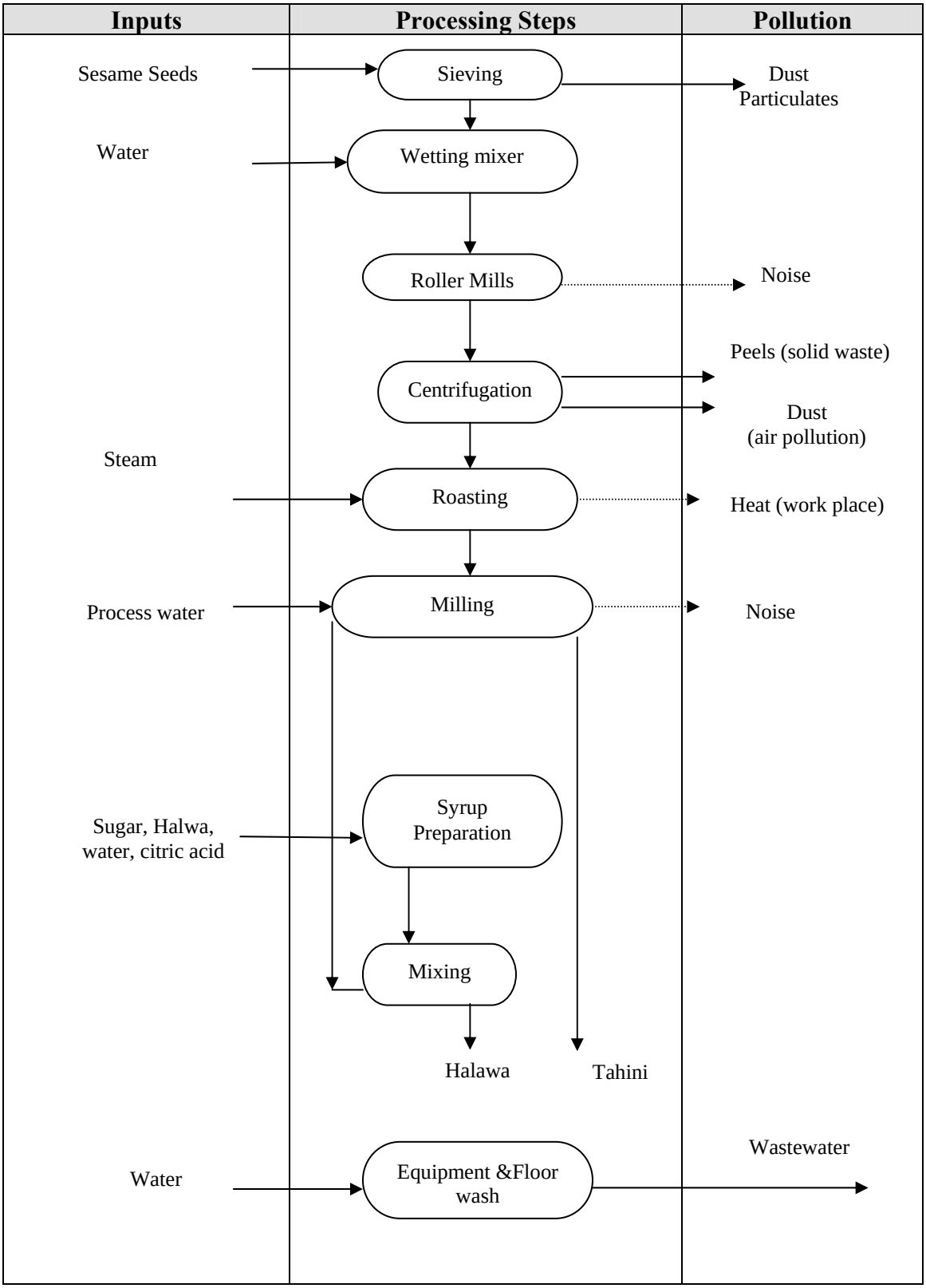
Mixing and packaging

Tahini is mixed with the syrup according to specs. The produced mixture is molded either manually or mechanically and wrapped in aluminum foil or plastic containers.

Note:

- Pesticides could be used to eliminate flies and other pests.

Fig (4) Tahini and Halawa Production Line and related pollution sources



2.2.5 Toffee Production Line

Fig (5) presents the main processing steps for the production line, the inputs to the units and the pollution sources. These steps are:

Cooking under vacuum — Sucrose, water, starch and fat are fed to a jacketed stirred cooker where the mixture is heated under vacuum. Steam is introduced in the jacket to provide the necessary heat. Glucose is then added and the boiling continued until the right consistency is reached.

Cooling — The mixture is then transferred and spread onto cooling tables where color pigments and flavor are added and blended in. The tables are double-walled to allow the flow of the cooling water.

Packaging — The product is then transferred between the cylinders of a roller mill that produces a sheet of toffee that is cut into pieces of the desired size. Wrapping and packaging is also done automatically.

Note:

- Heating under vacuum allows boiling to occur at a lower temperature so that burning does not occur.
- Find out what happens when an out-of-spec batch is produced.

2.2.6 Corn Flakes Production Line

The raw materials used are grits, water, sugar, malt and salt. The production steps are:

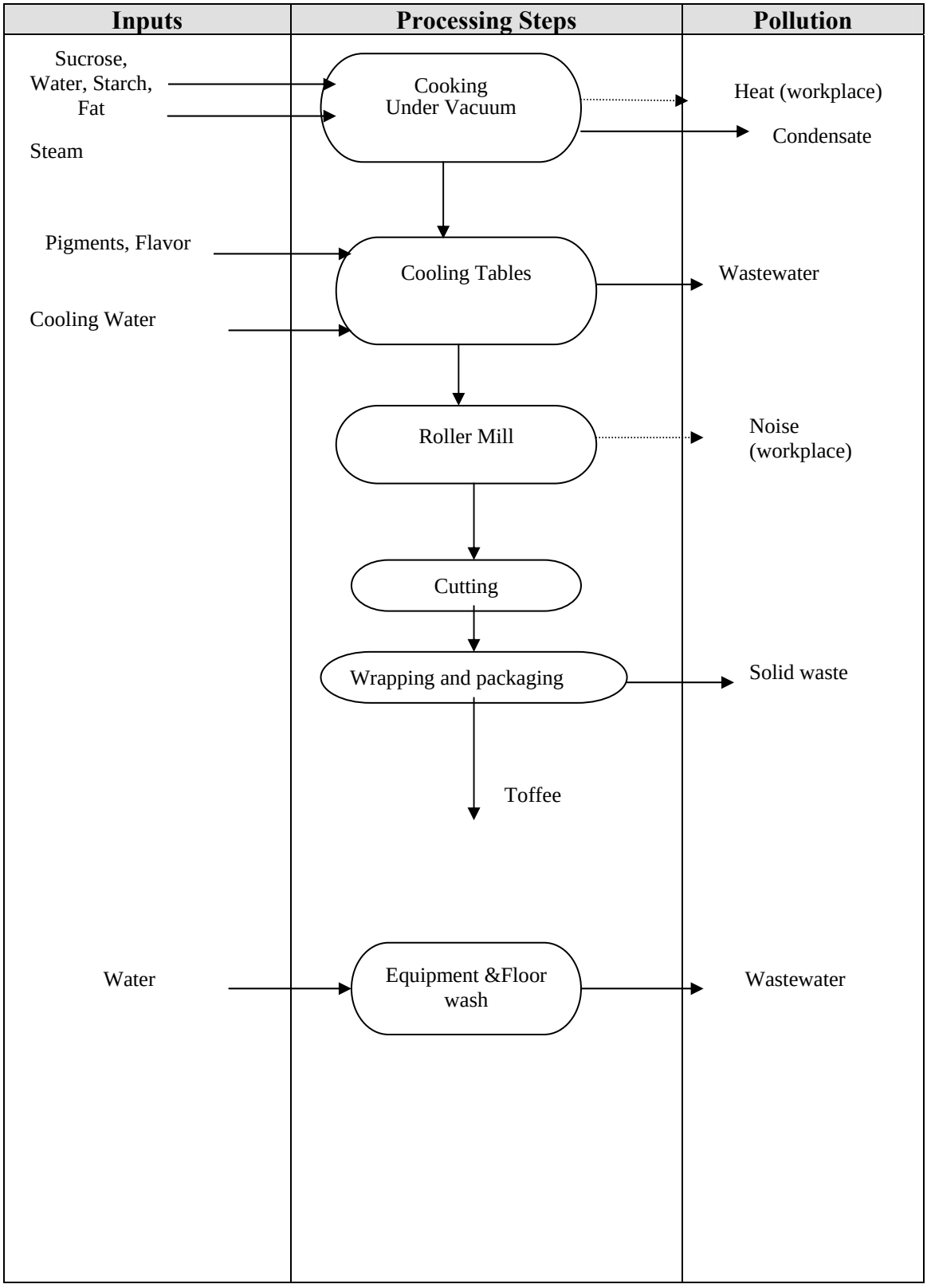
Cooking — Weighed amounts of the raw materials are fed to a pressure cooker. Steam is introduced in the jacket to provide the heat necessary for cooking.

Roasting — The cooked product is fed between the cylinders of a roller mill producing a sheet of specific thickness. The sheets are introduced in a tunnel oven on belt conveyors to be roasted according to specs. Natural gas is usually used as fuel.

Packaging — Ventilators are used to cool the roasted product, which is then packaged in nylon bags and boxes.

Note:
The main pollution sources are heat in the workplace and product spill.

Fig (5) Toffee Production Line and Related Pollution Sources



2.2.7 Bread and Cakes Production Line

The bread production line is almost similar to the cake production line. The difference lies in the raw materials used. For bread production the raw materials are flour, sugar, fat, salt, yeast, powdered milk and water. The raw materials for cake production are flour, butter, eggs, sugar, malt, baking powder, nuts, dried fruits, powdered milk and water. Fig (6) presents the processes involved in the bread production line and the pollution sources.

Dough preparation

The raw materials for bread production are weighed and fed to a mixer. The dough is then left to rise (primary fermentation).

In the case of cake production, flour and butter are mixed while sugar, eggs, powdered milk and water are blended in another vessel then poured onto the mixer. Baking powder, malt and flavors are then added together with nuts and dried fruits depending on the type of cake.

Cooking

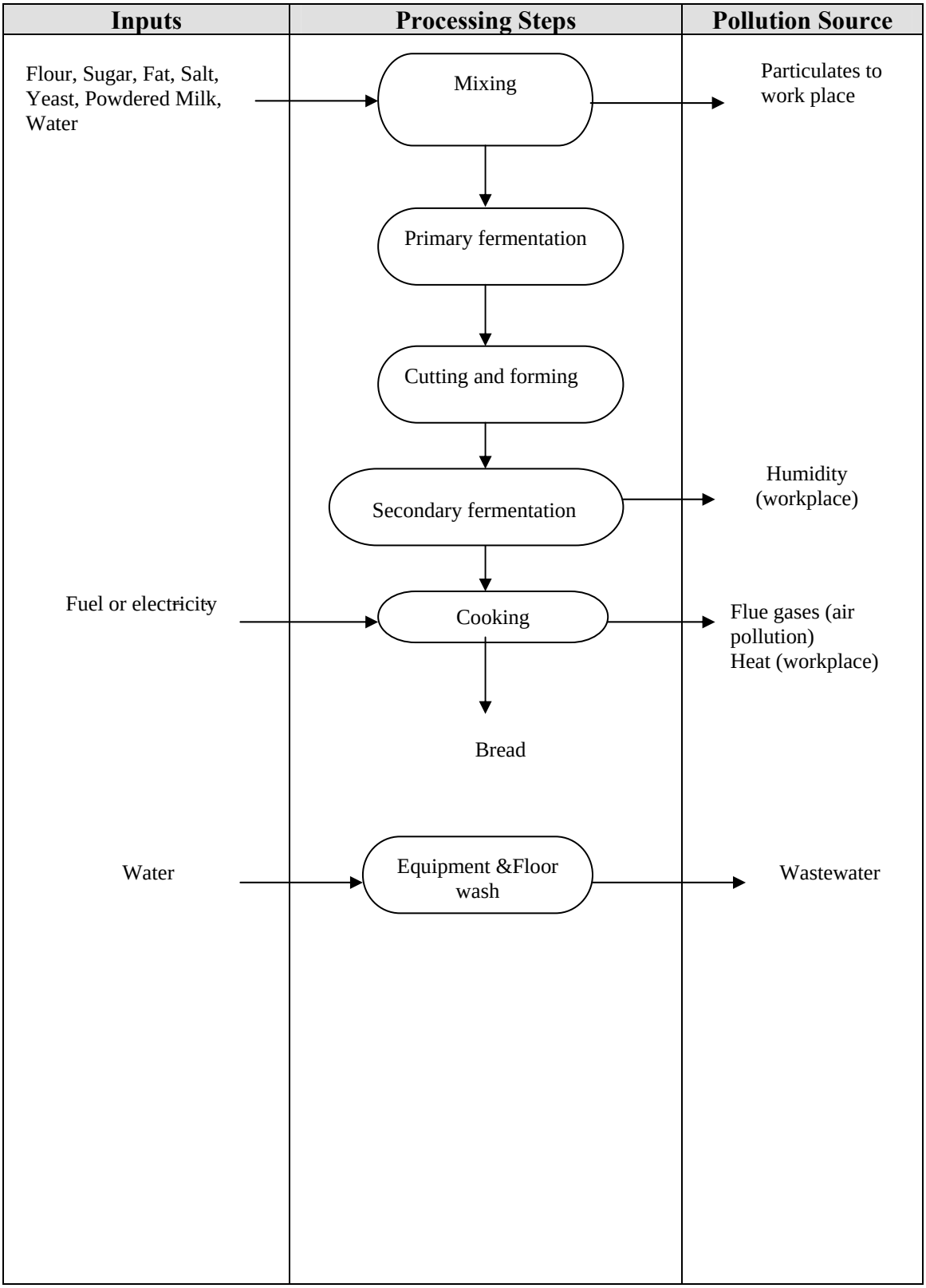
The dough is fed to a filling machine that distributes it into oven pans. The pans travel on a belt conveyor to be placed in the oven or go through it in the case of tunnel ovens. For bread production, the dough is allowed a second fermentation period before being introduced into the oven. Fermentation requires a controlled environment with specific temperature and humidity.

The heating source for the oven can be electricity or fuel combustion.

Cooling and packaging

Ventilators are usually used for cooling the cooked products which are then automatically wrapped in cellophane or plastic and packed in boxed.

Fig (6) Bread Production Line and Related Pollution Sources



2.3 Service Units: Description and Potential Pollution Sources

Medium and large size plants will have some/all of the following service and auxiliary units. These units can be pollution sources and therefore should be inspected and monitored. Fig (7) shows the various units with their corresponding raw materials and potential pollution sources.

2.3.1 Boilers

Boilers are used to produce steam for:

- heat supply to the processes
- electric power generation

Conventional steam-producing thermal power plants generate electricity through a series of energy conversion stages. Fuel is burned in boilers to convert water to high-pressure steam, which is then used to drive the turbine to generate electricity.

The gaseous emissions generated by boilers are typical of those from combustion processes. The exhaust gases from burning fuel oil (Mazot) or gas oil (solar) contain primarily particulates (including heavy metals if they are present in significant concentrations in the fuel), sulfur and nitrogen oxides (SOx and NOx) and volatile organic compounds (VOCs).

The concentration of these pollutants in the exhaust gases is a function of firing configuration (nozzle design, chimney height), operating practices and fuel composition.

Natural gas-fired boilers generally produce negligible quantities of particulates and pollutants.

Wastewater is generated as blowdown purged from boilers to keep the concentration of dissolved salts at a level that prevents salt precipitation and consequently scale formation. The blowdown will be high in TDS.

In the case of power plants, water is used for cooling the turbines and is also generated as steam condensate. The amount of wastewater generated depends on whether cooling is performed in open or closed cycle and on the recycling of steam condensate. Contamination may arise from lubricating and fuel oil.

2.3.2 Water Treatment Units

There are different types of water used in industry. Depending on the application and the water source, different treatment processes are applied.

a) ***Water Softening for medium hardness water:*** Calcium and magnesium ions are removed from hard water by cation exchange for sodium ions. When the exchange resin has removed the ions to the limits of its capacity, it is regenerated to the sodium form with a salt solution (sodium chloride) in the pH range of 6-8. This is

performed by taking the softener out of service, backwashing with the salt solution, rinsing to eliminate excess salt, then returning it to service. The treated water has a hardness level of less than 1 ppm expressed as calcium carbonate.

b) ***Water softening for very high bicarbonate hardness:*** Water from wells and canals is pre-treated before softening. Water is treated first by the lime process, then by cation exchange. The lime process reduces dissolved solids by precipitating calcium carbonate and magnesium hydroxide from the water. It can reduce calcium hardness to 35 ppm if proper opportunity is given for precipitation. A coagulant such as aluminum sulfate (alum) or ferric sulfate is added to aid magnesium hydroxide precipitation. Calcium hypochlorite is added in some cases. Currently the use of organic polyelectrolytes is replacing many of the traditional inorganic coagulant aid. Sludge precipitates and is discharged to disposal sites whereas the overflowing water is fed to a sand filter followed by an activated carbon filter that removes any substances causing odor and taste. A micro filter can then be used to remove remaining traces. A successful method to accelerate precipitation is contacting previously precipitated sludge with the raw water and chemicals. The sludge particles act as seeds for further precipitation. The result is a more rapid and more complete reaction with larger and more easily settled particles.

c) ***Reverse Osmosis:*** Demineralization can also be performed by reverse osmosis. In this process water is forced through a semi-permeable membrane by applying pressure.

2.3.3 Cooling Towers

Cooling water is used extensively in industry. During the cooling process, water heats up and can only be reused if cooled. Cooling towers provide the means for recycling water and thus minimizing its consumption. The cooling effect is performed through partial evaporation. This causes an increase in the concentration of dissolved salts which is controlled by purifying some water (blowdown). The blowdown will be high in TDS.

2.3.4 Clean In Place (CIP)

The Clean in Place (CIP) system consists mainly of a wash tank and recycling pumps. Its main purpose is to minimize wash water consumption by recycling part of the spent wash water. Detergents, acids and/ or alkalis are added to the wash water when equipment

washing is performed. In this case, the use of CIP will also minimize the consumption of these additives.

After using the spent wash water for a number of cycles, it is discharged to the factory sewer system causing a shock load of pollutants. The nature of the pollutants depends on the material or equipment being washed and the additives used. The most important parameters are O & G, BOD, COD, TSS.

2.3.5 Laboratories

Laboratories have an important role in the food industry, as they are responsible for:

- Testing raw materials, chemicals, water, wastewater, packaging material, etc.
- Quality control of the different products and comparing the findings with the standard specifications for raw materials and final products
- The measured parameters are physical properties, chemical composition, and bacteriological counts.

Chemicals used for testing could be hazardous. Proper handling and storage are required for compliance with environmental law.

2.3.6 Workshops and Garage

Large facilities have electrical and mechanical workshops for maintenance and repair purposes. Environmental violations could be due to:

- Noise
- Rinse water contaminated with lube oil
- Spent lube oils

Pollution in the garage area will depend upon the services offered. The presence of a gasoline or diesel pumping station implies fuel storage in underground or over the ground tanks that require leak and spill control plans.

Replacing lube oil implies discharge of spent oil to the sewer lines or selling it to recycling stations.

2.3.7 Storage Facilities

The specifications for the storage facilities depend on the stored material.

- Oil, butter and margarine are bought in barrels, which are moved from the raw material storage area to the processing area. The empty barrels are washed and stored for reuse.
- Flour is bought in large sacs of about 100 kg weight, which are carried on the back of the workers to the processing area. A hook is used to facilitate their handling tearing the sack and causing loss of flour (solid waste pollution).
- Packaged products are packed in carton boxes and stored in product storing buildings.

- Some of the chemicals used in the lab could be hazardous and require special handling, storage and management procedures as required by law.
- Fuel is used for the boilers, for the ovens and for the cars and delivery trucks. It is stored in underground or over ground tanks. The types of fuel usually used are fuel oil (Mazot), gas oil (solar), natural gas and gasoline. Fuel storage requires safety measures and spill prevention plans.

2.3.8 Wastewater Treatment Plants

Although a WWTP is a pollution abatement measure, it has to be inspected and monitored for potential pollution. Pollution may be due to malfunctioning or improper management. The confectionery industry discharges mainly equipment and floor wash-water contaminated with raw material and product losses. Although these losses are solid in nature (biscuits, flour, wafers..), they increase the organic load of the wastewater due to poor housekeeping practices. The solids are washed down the drain instead of being collected and disposed of in the solid form.

From time to time peak load will be discharged in the effluent. It may be due to internal processes, to seasonal fluctuations, to lack of control or a “force majeur” situation such as power collapse.

The potential pollution sources from the wastewater treatment plant are:

- Sludge which can be processed and reused as fertilizer.
- Treated water could represent a water pollution problem if not complying with environmental laws

2.3.9 Restaurants and Housing Complex

These facilities will generate domestic wastewater as well as domestic solid waste.

Fig (7) Service Units and Their Related Pollution Sources

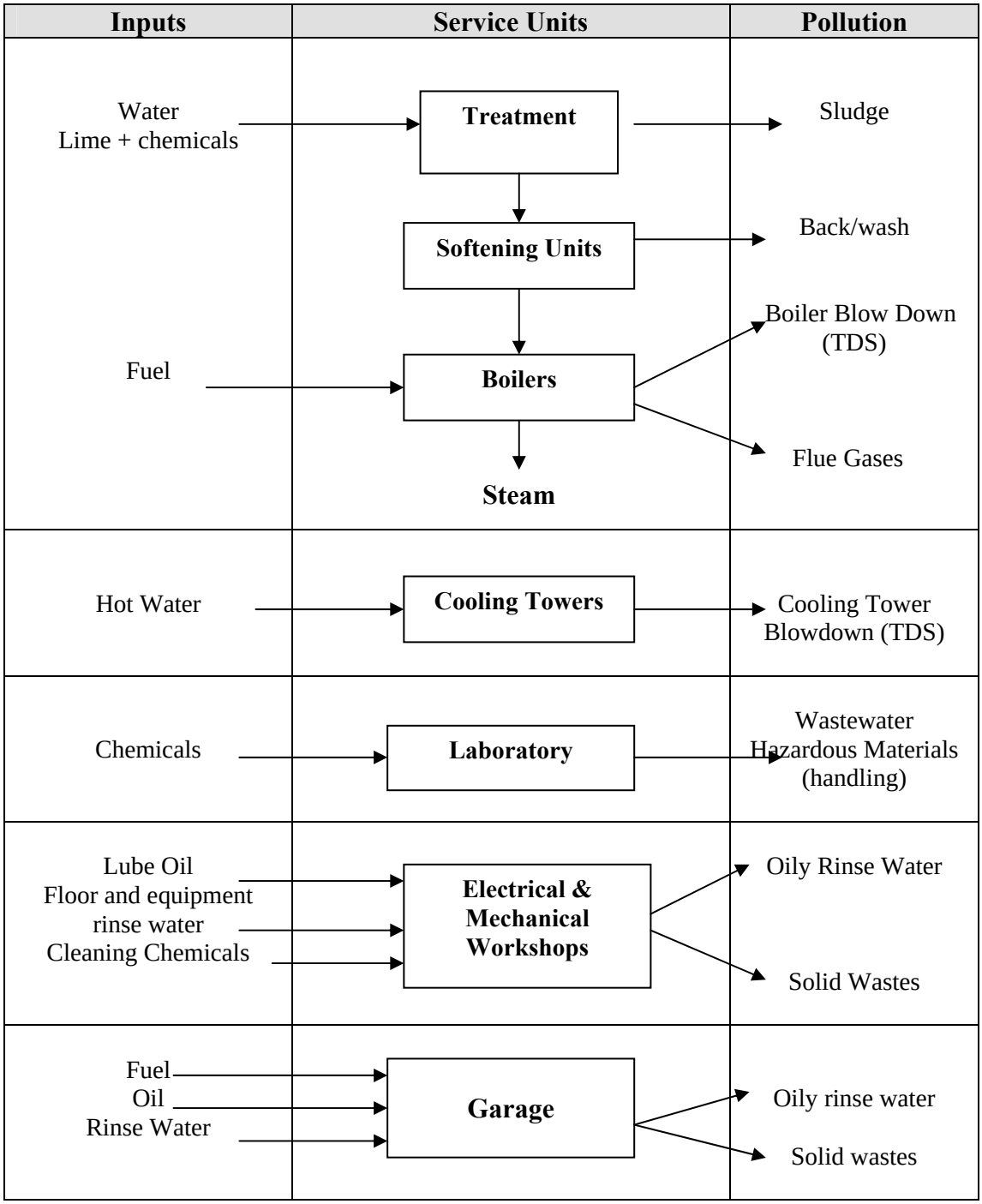
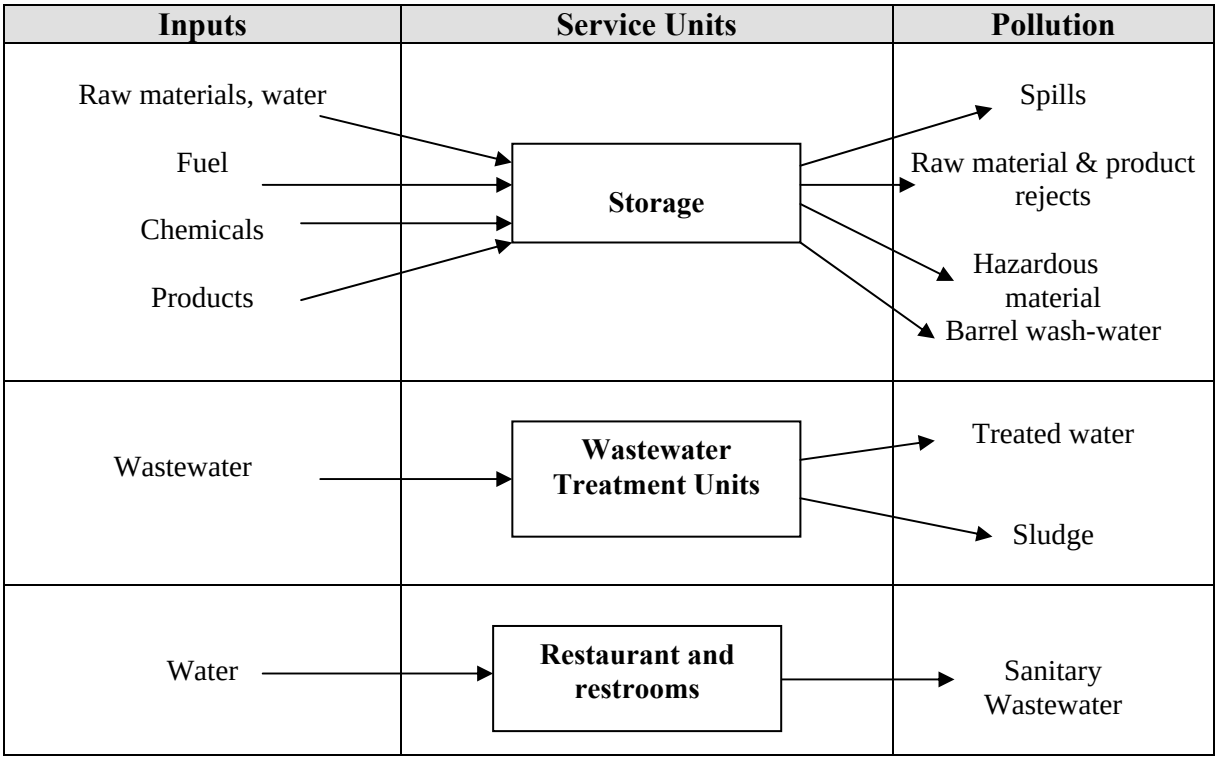


Fig (7) Service Units and their Related Pollution Sources (Cont.)



2.4 Emissions, Effluents and Solid Wastes

Table (4) summarizes the major polluting processes, their outputs and the violating parameters.

2.4.1 Air Emissions

The sources of air emission in the confectionery industry are:

- Exhaust gases resulting from fuel consumption used to generate steam from boilers and in some facilities from the ovens heated by fuel combustion. The violating parameters would be: particulate matters (PM10), sulfur oxides, nitrogen oxides and carbon monoxide.
- Particulate matter (flour and dust particles) generated from flour sieving, dough preparation, sesame seeds screening and cocoa winnowing. Workplace air quality could be affected.

2.4.2 Effluents

The confectionery industry does not generate large volumes of effluents as compared to the fruits and vegetable processing industry. However, the generated wastewater contains high organic loads, cleansing agents and suspended and dissolved solids. The various sources of pollution are:

- Cocoa beans and sesame seeds wash-water, which is expected to be high in suspended and dissolved solids.
- Cream filling machines, which are responsible for spills that raise the BOD level in the wastewater.
- Flour particles that settle on the floor and solid waste generated from the wafer and biscuit lines. Due to poor housekeeping practices they are washed to the sewer. The wastewater will be contaminated with organic matter and suspended solids.
- Washing of empty barrels used to store butter and margarine, which will generate oily wastewater.
- Blowdown from the cooling tower and boilers as well as backwash of softeners, which are high in TDS and TSS.
- Spent lube oil from garage and workshops, which if discharged to sewer, will give oily wastewater (O&G).
- Floor and equipment washing and sanitation, which produce a wastewater containing organic matter, oil and grease, and traces of the chemicals used for sanitation.

Table (4) Pollutants Per Process

Major Polluting Processes	Process Inputs	Process Outputs	Pollutants	Impacts
Flour handling and sieving	Flour	Sieved flour	Flour particles	Air (workplace) Water, Soil
Dough preparation	Flour, water and other raw materials	Dough	Solid waste (flour particles)	Water Soil
Cocoa beans and sesame seeds washing	Cocoa beans/ Sesame seeds	Washed raw materials		
	Water	Wash water	Suspended solids	Water
Shells or husk separation	Cocoa beans or sesame seeds	Prepared raw material		
		Solid waste	Solid waste	Soil
Grinding	Cocoa nibs or sesame seeds	Ground product	Solid waste, Noise	Water, Soil, Workplace
Roasting	Cocoa or sesame Fuel or electricity	Roasted product		
		Flue gases	If mazot (fuel oil) is used, SOx, solid waste	Air pollution, Heat
Cooking	Dough Fuel or electricity	Cooked products		
		Flue gases, rejects	If mazot (fuel oil) is used, SOx, solid waste	Air pollution, Heat, Soil
Dough sheeting	Dough	Sheets of dough	Noise	Workplace
Spreading and sandwiching	Biscuits/wafers and filling	Cream filled biscuits/wafers and rejects	Solid waste	Soil, water
Softeners	Raw Water	Treated Water		
		Backwash	TDS, TSS	Water
Boilers	Treated Water + Condensate recycle	Blowdown	TDS, TSS	Water
	Fuel	Flue Gasses	CO, SO_x	Air
Cooling Towers	Water	Blowdown	TDS, TSS	Water
WWTP	Process WW	Treated effluent	BOD, COD, TSS, Color	Water
		Sludge	TSS	Soil
Equipment and floor wash	Wash water	Wastewater	BOD, COD, TSS, O&G	Water

Typical effluent characteristics of the Egyptian confectionery industry are shown in table (5). Typical pollution loads per ton of production are given in table (6). It is clear that the main impact will be due to high organic loads.

Table (5) Typical Chemical Analysis of Effluent from Confectionery Production Facilities

	pH	BOD mg/1	COD mg/1	TSS mg/1	TDS mg/1	Oil& Grease mg/1
Effluent from biscuits and wafers production lines	6.5	1700	4290	1510	473	1730

Table (6) Typical Organic Pollution Loads Per Day

	Effluent flow rate, m3/d	BOD, kg/d	COD, kg/d
Effluent from biscuits and wafers production lines	200	240	718

2.4.3 Solid Wastes

Solid wastes generated from the various operations are:

- Wafer and biscuits rejects.
- Flour spills in the storage area and at the dough preparation unit.
- Scrap at the workshops and garage, which is usually sold.
- Sludge generated from the biological wastewater treatment plant.

There are no hazardous wastes discharged from the confectionery industry.

2.5 Characteristics Specific to the Confectionery Industry

The raw materials for this industry are relatively expensive and therefore the produced wastes are generally high quality and tend to be more carefully controlled than in some other sub-sectors. There are some characteristics specific to the industry that should be taken into consideration when conducting inspection and/or self-monitoring of the confectionery industry.

- The main pollution load in the wastewater is due to poor solid waste management.
- Most of the operations are performed by machines.
- Production lines are operated on a semi-continuous basis with parts of the production lines operating in batches.
- Due to the special nature of food processes, washing and sanitation are performed at least once a day for both operating modes (batch or continuous).
- Pollution loads are expected to be higher during start-up and shutdown of production line.
- The industry does not use large amounts of water.
- This sub-sector is a very large consumer of energy.

3. Impact of Pollutants on Health and Environment

3.1 Impact of Air Emissions

Particulate matters Recent epidemiological evidence suggests that much of the health damage caused by exposure to particulates is associated with particulate matters smaller than 10μm (PM_{10}). These particles penetrate most deeply into the lungs, causing a large spectrum of illnesses (e.g. asthma attack, cough, bronchitis).
Emissions of particulates include ash, soot and carbon compounds, which are often the result of incomplete combustion. Acid condensate, sulphates and nitrates as well as lead, cadmium, and other metals can also be detected in the flue gases.
Flour particles, cocoa powder and dust are emitted to air and have a negative impact on air quality in the workplace.

Sulfur Oxides Air pollution by sulfur oxides is a major environmental problem. This compound is harmful to plant and animal life, as well as many building materials. Another problem of great concern is acid rain which is caused by the dissolution of sulfur oxides in atmospheric water droplets to form acidic solutions that can be very damaging when distributed in the form of rain. Acid rain is corrosive to metals, limestone, and other materials.

Nitrogen Oxides Nitrogen oxides also dissolve in atmospheric water droplets to form acid rain.

Carbon dioxide Combustion of fossil fuels to produce electricity and heat contribute to the green house effect caused by the formation of carbon dioxide. The greenhouse phenomenon occurs when heat radiation from earth is absorbed by the gases causing a surface temperature increase.

Water Vapor (Humidity) Humidity affects the respiratory system especially for people suffering from asthma.

3.2 Impact of Effluents

The effluent could violate the Egyptian environmental laws as shown in section (4.2).
Spent lube oil from garage and workshops could be a cause for concern if discharged into the sewer system.
The organic material in wastewater stimulates the growth of bacteria and fungi naturally present in water, which then consume dissolved oxygen.

The environmental impact of the wastewater depends on the receiving water body. The Ministry of Irrigation has set limits for the pollutants in the wastewater

discharged into agriculture canals and drains as well as the Nile river for their detrimental effect on agriculture (Decree 8/1983). The parameters of relevance to the confectionery industry are BOD, COD, TSS and TDS.
Discharge of polluted wastewater high in BOD into lakes and sea can cause eutrophication and impact bio-diversity.

Sudden discharge of high BOD loads to the public sewer system will have an indirect environmental impact. Shock loads can cause malfunction of the domestic wastewater treatment plant.

3.3 Environmental Impact of Solid Wastes

Solid waste is mainly composed of

- out-of-spec products that are dumped or sold as animal fodder
- scrap from the garage, workshops and packaging area, that is collected and sold.

No impacts are expected on soil but broken biscuits and wafers contaminate the wastewater from the plant.

4. Egyptian Laws and Regulations

There are a number of laws and regulations that address the different environmental violations. The following are the laws applicable to the Confectionery Industry.

4.1 Concerning Air Emissions

Article 40 of Law 4/1994, article 42 of the executive regulations and annex 6 deal with gaseous emissions from combustion of fuel. The statutes relevant to the fuel combustion are:

- The use of solar oil and other heavy oil products, as well crude oil shall be prohibited in dwelling zones.
- The sulfur percentage in fuel used in urban zones and near the dwelling zones shall not exceed 1.5%.
- The design of the burner and fire-house shall allow for complete mixing of fuel with the required amount of air, and for the uniform temperature distribution that ensure complete combustion and minimize gas emissions caused by incomplete combustion..
- Gases containing carbon dioxide shall be emitted through chimneys rising sufficiently high in order that these gases become lighter before reaching the ground surface, or using fuel that contains high proportions of sulfur in power generating stations, as well as in industry and other regions lying away from inhabited urban areas, providing that atmospheric factors and adequate distances to prevent these gases from reaching the dwelling and agricultural zones and regions, as well as the water courses shall be observed.
- Chimneys from which a total emission of wastes reaches 7000 – 15000 kg/hr, shall have heights ranging between 18 – 36 meters.
- Chimneys from which a total emission of gaseous wastes reaches more than 15000 kg/hour, shall have heights exceeding at least two and a half times the height of surrounding buildings, including the building served by the chimney.

The permissible limits of emissions from sources of fuel combustion are given in table (7).

Table (7) Maximum Limits of Emissions from Sources of Fuel Combustion

parameters	Maximum limit, mg/m^3 of exhaust

Sulfur Dioxide.	3400
Carbon Monoxide.	250
Smoke.	50

4.2 Concerning Effluents

Limits for pollutants in wastewater vary depending on the type of receiving water body. The parameters that should be monitored and/or inspected are BOD, COD, pH, temperature, residual chlorine, TSS, TDS, Oil and Grease.
Table (8) presents the permissible limits for discharges to the different recipients (sea, Nile, canals, agricultural drains, public sewer) according to the different relevant laws.

Spent lube oil has a negative impact on water and soil and therefore its disposal should be monitored/inspected. A record should be kept for this purpose.

Table (8) Egyptian Environmental Legal Requirements for Industrial Wastewater

Parameter (mg/1 unless otherwise noted)	Law 4/94: Discharge Coastal Environment	Law 93/62 Discharge to Sewer System (as Decree 44/2000)	Law 48/82: Discharge into :			
			Underground Reservoir & Nile Branches/Canals	Nile (Main Stream)	Drains	
					Municipal	Industrial
BOD (5day,20 deg.)	60	<600	20	30	60	60
COD	100	<1100	30	40	80	100
pH (Grease)	6-9	6-9.5	6-9	6-9	6-9	6-9
Oil & Grease	15	<100	5	5	10	10
Temperature (deg.)	10C>avg. temp of receiving body	<43	35	35	35	35
Total Suspended Solids	60	<800	30	30	50	50
Settable Solids	__	<10	__	20	__	__
Total Dissolved Solids	2000	__	800	1200	2000	2000
Chlorine	__	<10	1	1	__	__

4.3 Concerning Solid Wastes

A number of laws address solid waste management. The following laws apply to scrap and sludge from the WWTP:

- Law 38/1967 which addresses public cleanliness, regulates the collection and disposal of solid wastes from houses, public places, commercial and industrial establishments.
- Ministry of Housing, Utilities and Urban Communities (MHUUC) decree No. 134 of 1968, which provides guidelines from domestic and industrial sources, including specifications for collection, transportation, composting, incineration and land disposal.
- Law 31/1976, which amended law 38/1967
- Law 43/1979, the Law of Local administration, which provided that city councils are responsible for "physical and social infrastructure", effectively delegating responsibility for infrastructure functions.
- Law 4/1994 regulates incineration of solid waste

4.4 Concerning Work Environment

Violations of work environment could be encountered:

- In the boiler house: gas emissions, regulated by article 43 of Law 4/1994, article 45 of the executive regulations and annex 8.
- Wherever heating is performed: temperature and humidity are regulated by article 44 of Law 4/1994, article 46 of the executive regulations and annex 9.
- In refrigeration rooms: ammonia leaks are regulated by article 43 of Law 4/1994, article 45 of the executive regulations and annex 8.
- Near heavy machinery: noise is regulated by article 42 of Law 4/1994, article 44 of the executive regulations and table 1, annex 7.
- Ventilation is regulated by article 45 of Law 4/1994 and article 47 of the executive regulations.
- Smoking is regulated by article 46 of Law 4/1994 and article 48 of the executive regulations, and Law 52/1981.
- Work environment conditions are addressed in Law 137/1981 for Labor, Minister of Housing Decree 380/1983, Minister of Industry Decree 380/1982

The limits for the relevant pollutants are presented in Table (9).

Table (9) Permissible Limits as Time Average and for Short Periods

Material	Limits			
	Time average		Exposure limits for short periods	
	ppm	mg/m^3	ppm	mg/m^3
Ammonia	25	18	35	27
Carbon dioxide	5000	9000	15000	27000
Carbon monoxide	50	55	400	440
Sulfur dioxide	2	5	5	10

4.5 Concerning Hazardous Material and Wastes

Law 4/1994 introduced the control of hazardous materials and wastes. The confectionery industry does not generate any hazardous wastes. The hazardous chemicals used in the lab and the fuel for the boilers, fall under the provisions of Law 4/1994. Articles 29 and 33 of the law makes it mandatory for those who produce or handle dangerous materials in gaseous, liquid or solid form, to take precautions to ensure that no environmental damage shall occur. Articles 25, 31 and 32 of the executive regulations (decree 338/1995) specify the necessary precautions for handling hazardous materials. Storing of fuel for the boilers is covered by the Law 4 as hazardous material There is no explicit articles in Law 4/1994 or in decree 338/1995 (executive regulations), regarding holding a register for the hazardous materials; article 33 is concerned with hazardous wastes. However, keeping the register for the hazardous materials is implicit in article 25 of the executive regulations regarding the application for a license.

4.6 The Environmental Register

Article 22 of Law 4/1994 states that the owner of the establishment shall keep a register showing the impact of the establishment activity on the environment. Article 17 and Annex 3 of the executive regulations specify the type of data recorded in the register.

The emergency response plan and the hazardous materials register will also be part of the environmental register as stated in part 4.5.

5. Pollution Abatement Measures

This section deals with pollution abatement in the three media air, water and soil. Three types of interventions will be considered:

- In-plant modifications, which are changes that are performed in the plant to reduce pollutant concentrations in streams through recovery of materials, segregation and/or integration of streams, reducing the flow rate of the wastewater streams that need further treatment to reduce the hold-up of the required WWTP.
- In-Process modifications, which are changes performed on the process such as the introduction of newer technology, substitution of a hazardous raw material, performing process optimization and control.
- End-of-pipe (EoP) measures, which involve treatment of the pollutant or its separation for further disposal. Whereas in-plant and in-process modifications usually have an economic return on investment, end-of-pipe measures will be performed for the sole purpose of compliance with the laws without economic

Egyptian Environmental Laws do not require water and energy conservation measures. These measures have been considered in this manual since resource depletion and hence conservation is a worldwide-recognized environmental issue that could be implemented in Egypt in the near future. Water conservation measures can lead to higher concentrations of pollutants in the effluent streams. Both energy and water conservation measures will provide both financial and economic benefits.

The term Cleaner Production (CP) refers to the same concepts of pollution reduction through in-process, in-plant and resource conservation, in contradistinction to end-of-pipe treatment. In many cases, the adoption of CP can eliminate the need for (EoP) treatment.

The following CP and EoP measures have been identified for the confectionery industry.

5.1 Air Pollution

Flue gases

Particulate matter in flue (exhaust) gases are due the ash and heavy metal content of the fuel, low combustion temperature, low excess oxygen level, high flow rate of flue gases. *Sulfur dioxide* is due to the sulfur content of the fuel. *Nitrogen oxides* are formed when maximum combustion temperature and high excess oxygen. *Carbon monoxide* is formed when incomplete combustion occurs at low air to fuel ratio.

The following measures can be adopted to minimize air pollution from flue (exhaust) gases:

- Replace Mazot by solar or natural gas. Mazot is high in sulfur content.
- Regulate the fuel to air ratio for an optimum excess air that ensures complete combustion of carbon monoxide to dioxide.

- Keep the combustion temperature at a moderate value to minimize particulate matter and nitrogen oxides.

5.2 Water Pollution Abatement Measures

In-plant modifications

- Procure and store flour in smaller packages (50 kg instead of 100 kg) makes it easier to handle and decreases spills on floor that can be washed to the sewer.
- Ingredients tend to spill or disperse into air when poured into feeding hoppers. There may be options to redesign the process to prevent wastage. Cyclones can be introduced to recover the losses.
- Provide simple treatment options (sedimentation, coalescing plate filters, etc..) to allow water to be recycled.
- Use a dry scraping method first to remove product from vats and mixers and the dry cleaning of floors and other areas results in less liquid wastes and more opportunities for segregation and recovery.
- Implementation of a quality control system such as HACCP (Hazard Analysis & Critical Control Point) is recommended to minimize waste.
- Integration and segregation of sewer lines to minimize treatment needs and ensure compliance with the environmental laws, can be an option for many factories. In some cases where there are several discharge points from the factory, mixing of the streams could lead to compliance. In other cases where treatment is imperative some streams could be segregated and discharged without violation. The remaining streams will require a smaller treatment unit.

In-process modifications

- Implementation of a control system involving pressure regulators on the steam lines, temperature controllers, flow controllers…
- Install DAF unit to recover suspended material.
- Use countercurrent systems where washing is necessary.
- Replace batch processes with continuous ones.
- Modernize the equipment.
- Improve hygiene will lead to lower rejects.
- Use state-of-the-art tempering and conching equipment for chocolate production will lead to higher quality standards and lower rejects, while for the hard candy better process control will minimize wastes.

End-of-pipe treatment

Because of the typically high content of suspended solids, COD and BOD in the confectionery industry waste-streams, end-of-pipe treatment frequently involves settling tanks and biological treatment. Pretreatment of effluents consists of screening, flow equalization, neutralization and air flotation (to remove fats and solids); it is normally followed by biological treatment. If space is available pond systems are potential treatment methods. Other possible biological treatment methods include trickling filters, rotating biological contactors and activated sludge treatment.

5.3 Abatement Measures for Solid Waste Pollution

Product rejects

- Recycle biscuits and wafers wastes into product. The broken or spoiled biscuit material can usually be added as an ingredient into some other confectionery product provided that it is segregated and kept clean.
- Sell downgraded product at a lower price to staff.
- Organic waste from the factory should be used in the production of animal feed or organic fertilizers

Scrap

Scrap is collected and sold.

Sludge

- Effluent treatment processes generate solids. On average 70-80% of the original carbon is converted to solids. This sludge is subject to putrefaction, is malodorous and offensive. It can also be hazardous to health by absorbing pathogens that multiply in this favorable medium and toxins. Raw sludge is saturated with bound water, should be de-watered and disposed of in sanitary landfills.
- Sludge can also be generated from water treatment when lime and chemicals are used.

5.4 Water and Energy Conservation

Water and sewer service costs have been rising, and these increases can cut into profits. Using water more efficiently can help counter these increases.

Water Conservation

- Install water meters and monitor water use
- Use automatic shut-off nozzles and mark hand-operated valves so that open, close and directed-flow positions are easily identified.
- Use high-pressure, low-volume cleaning systems, such as CIP (clean in place) for washing equipment.

- Install liquid level controls with automatic pump stops where overflow is likely to occur.
- Recycle cooling water through cooling towers.
- Minimize spills on the floor minimizes floor washing.
- Repair leaks.
- Handle solid waste dry.
- Recycle steam condensate whenever economically viable.

Energy conservation measures

- Insulation of steam lines.
- Installation of steam traps.
- Repair or replace steam valves.
- Maximize boilers efficiency.
- Install pressure regulators on steam lines.

6. Industrial Inspection

The inspection of the confectionery industry will follow the procedures described in the Inspection Guidelines. This chapter presents a summary of the inspection process regarding the purpose and scope of various types of inspection, and the proposed inspection procedure for the Confectionery Industry.
The overall purpose of inspections is to enforce environmental laws. Table (10) lists the various types of inspections and the objectives that have to be fulfilled for each type.

Table (10) The Different Types of Inspections and their objectives

Inspection type	Objectives
Site Inspection	
1. Comprehensive	Evaluate compliance status regarding all aspects of Law 4
2. Specific	Evaluate compliance status regarding some aspects of Law 4 Review special conditions set by EEAA in EIA studies. Investigate complaints.
3. Follow-up	Check environmental register and implementation of compliance measures
Inspection campaign	
1. Geographic	Check pollution sources to specific receiving media
2. Sector specific	Check aspects relevant to specific sector

As evident from the above table, comprehensive inspection deals with all aspects of environmental laws and therefore is considered in this manual. Other inspection types can be tailored accordingly.

Developing an inspection strategy and quarterly and/or monthly plans are the responsibility of the inspectorate management. Developing site-specific inspection plans for carrying out the scope of work that fulfills inspection objectives is the responsibility of the inspection team. Planning for inspections is presented in more detail in the General Inspection Manual, GIM (EPAP, 2002)

7. Inspection Planning At the Inspectorate Level

The responsibilities of the inspectorate management regarding the specific inspection are to state clearly, in writing, the type of inspection and related objectives as well as the time schedule necessary to carry out inspection. The inspectorate management is also responsible for providing preliminary information about the facility, inspection tools, and logistics.

7.1 Activities Characteristic to the Confectionery Industry

Taking the comprehensive inspection as an example, the objectives stated in Table (10) dictate the activities required for covering all aspects of compliance with environmental laws and regulations. The required personnel, equipment and logistics are determined accordingly.

As evident from the information presented in section 1.2 concerning the size of the confectionery facilities, sub-sector 154 includes many other industries. This makes planning for inspection quite difficult. A more detailed survey is needed. It is however expected that small facilities will have one or two production lines with no treatment facilities. The inspectorate management should have a clear idea about how to proceed with inspection of this type of facilities, which will generate small pollution loads. End-of- pipe treatment calls for a considerable expenditure on small facilities. However, discharge to the public sewer system could be allowed for a surcharge. Large facilities are expected to have most production lines and most service units. These facilities could most probably, sustain pollution abatement measures.

Note to inspectorate management:
Usually small and medium size facilities cannot afford the cost of biological treatment. Repeated inspections and fines would not solve the problem. Inspectorate management should have a clear plan on how to proceed with these facilities.

7.2 Providing Information About the Facility

Chapters (2-7) present the technical aspects regarding the confectionery industry, its pollution sources and relevant environmental laws. Information regarding compliance history related to other inspecting parties (irrigation inspectors, occupational health inspectors, etc.) can be helpful in anticipating potential violations and preparing necessary equipment. Other sources of information can be found on the Internet at the following sites:

- http://www.tei.or.th/bep/ctic/danced.cfm
- http://www.lu.se/IIIEE/research/eastern_europe/lithuania/cp_kaunas_1993-95.html
- http://www.emcentre.com/unepweb/publication/food.html

- http://www.emcentre.com/unepweb/tec_case/food_15/house/casename.shtml

7.3 Providing Resources

The required personnel, tools and equipment depend on the size of the facility to be inspected.

Small facilities Small confectionery facilities will probably produce Bread and Cake, Toffee and Chewing gum. Most of the service units described in section (2.3) will not be present. The major pollution problem would be the discharge of contaminated wastewater to surface water bodies or the public sewer system. The contaminated wastewater is generated from equipment and floor washing. Unless an inspection campaign is planned, only one inspector is required for determining type of receiving body, reviewing the licenses, establishing the violation if any, and preparing the legal report.

Medium size facilities These facilities could have a number of production lines or specialize in one or two products with medium production capacity. Inspection of these facilities will be similar to inspection of large facilities. The size of the inspection team will depend on the number of production lines and service units.

Large facilities Large facilities will typically have many production lines with large production capacity. Planning for the comprehensive multi-media inspection will require several inspectors, sampling equipment to provide proper samples for analysis as well as measuring devices. A lab technician will also be needed. The inspectorate management will provide the inspection checklist presented in Annex (1).

8. Preparation for Field Inspection (Inspection Team)

As presented in the General Inspection Manual, GIM (EPAP-2002), tasks necessary for preparation for field inspection, are:

- Gathering information about the specific facility to be inspected
- Preparing of the inspection plan
- Preparing the checklists

This manual presents the case of a comprehensive multi-media site-inspection of a large confectionery facility since it represents the highest level of inspection complexity. Tasks for carrying out less complicated inspections can be easily deduced.

8.1 Gathering and Reviewing Information

The inspection team should review the general information prepared for the confectionery industry (chapters 2-5) and then check - if possible - what production lines and service units are present at the targeted facility. In addition to the required information listed in Annex (C) of the General Inspection Manual, GIM (EPAP-2002), it is important at this stage to determine the following:

- The type of receiving body for the industrial wastewater and review relevant Egyptian laws (Chapter 4).
- The scope of inspection and related activities based on the type and objectives of inspection required by the inspectorate management.
- The potential pollution hazards as addressed in section 2.4, and accordingly, define measurement and analyses needs.
- The characteristics of the confectionery industry as presented in section 2.5, and their implications on the inspection process of the targeted facility.

Note to inspector:

- *Some facilities dilute their polluted wastewater with fresh water before discharging to sewer. Decree 44/2000 explicitly prohibits this behavior.*

8.2 Preparation of the Inspection Plan

An example of an inspection plan is included in Annex (E) of the General Inspection Manual GIM (EPAP-2002). The plan should take into account the following:

- For large confectionery facilities, the inspection team could be divided into smaller groups. Each group will be responsible for inspecting a number of production lines and service units.
- At the beginning of the field visit, the inspection team should check the environmental register for completeness using the checklist provided in Annex (G) of the General Inspection Manual, GIM (EPAP-2002).

- The results of the analyses included in the environmental register should be checked at the end of the field visit (if suspicion arises about them) and copies of these results should be obtained.

Notes to inspector:

- *When the final effluent is expected to be in violation of environmental laws, sampling should be planned.*
- *Because of possible shock loads a grab sample at the time of discharge should be performed. If grab samples are taken when no shock load is discharged the results will not reflect the actual pollutants loads.*
- *To prove that a shock load has been discharged, a composite sample over the shift duration should be taken and sent to the laboratory to be analyzed. If the results show higher pollutant concentrations than those of the grab sample, then a shock load was discharged.*
- *Make sure that the polluting production lines are in operation since some factory management resort to halting the polluting lines during the inspection.*

8.3 Preparation of the Required Checklists

The checklist for the confectionery industry is presented in Annex (1) of this manual. The checklist has been prepared in such a way that it starts with general information about the facility and its operation. Separate checklists are then filled for each production line/service unit independently for relevant environmental aspects and media. The inspection team will compile the checklists relevant to existing production lines and service units in the targeted facility.

The development of checklists goes through the following steps:

- Draw the block flow diagrams for the production lines with their pollution sources as presented in the figures (1 to 7). Similar figures can be developed for other confectionery production lines that were not covered by this manual.
- Identify the areas of possible non-compliance and the parameters that need checking. For example, noise should be checked near the compressors and temperature and humidity where steam leaks occur.
- Identify what to observe, ask and/or estimate that can convey information about pollutants. For example:
  - The type of detergent or antiseptic determines the contaminant in the wash streams,
  - Oily effluents from production lines or oily cooling water indicates the contamination of the plant effluent with oil,

Note to inspector:
Law 4 does not specify standards for effluent from production lines but only for final discharge points. However, effluent quality from production lines is an important indicator of the final discharge.

8.4 Legal Aspects

As evident from chapter (2), a large confectionery facility is expected to be in violation of several environmental laws, specifically with respect to wastewater if no treatment is performed. The inspection team should be prepared for legally establishing such a violation.

Note to inspector:

- *The information about the nature and cause of the violation must be well documented and the evidence sound. The case could be contested in court and the inspector will be asked to defend his technical judgment.*

9. Performing the Field Inspection

9.1 Starting the Field Visit

The General Inspection Manual, GIM (EPAP, 2002) describes the procedures involved for entering an industrial facility. The inspector's attitude and behavior are very important from the start and will dictate the factory's personnel response to the inspection tasks.

Note to inspector:

- *It is better at this stage not to ask direct questions about spills of flour, sugar, butter on the floor. Interviewing the workers on-site in an indirect manner can give better results.*
- *Check the results of effluent analyses, time and place of sampling. If suspicious take your own sample and send it to the laboratory for analyses.*
- *The types of detergent and antiseptics used for cleaning and sanitation are important information for determining the type of pollutant in the effluent. In this case a direct question is preferred.*
- *Get a sketch of the factory layout with sewer lines and final disposal points.*

9.2 Proceeding With the Field Visit

Information gathered during the facility tour is dependent on interviews of facility personnel and visual observation. Annex (H) in the General Inspection Manual GIM (EPAP, 2002) presents some useful interviewing techniques.

Using the facility layout, start by checking the final disposal points and the various plants and/or service units connected to each point. This will determine where and how to take the effluent samples. Visual observations about the condition of the sewer manholes should be recorded. In some facilities the discharge to the receiving body is performed through a bayyara (cesspit), septic tanks or holding tanks. If the holding tank is not properly lined, contamination of the underground water could occur.

Note to inspectors:

Cesspits, septic tanks and holding tanks are a form of pre-treatment that generates settled sludge. Check:

- *The presence of accumulated sludge and related hygienic conditions*
- *The disposal of the sludge*

Inspection of the production lines should start with the feeding of raw materials and end with the product packaging and storage. Referring to Figures (I- 6), check the following:

Production Lines

Chocolate and powdered chocolate drink production line	- When does equipment and floor washing occur ? - What type of detergent is used for equipment and floor wash? - Is there any dust, particulate emissions, noise and heat in the work environment? - What happens to spills of chocolate powder and butter on the floor ? - Is cooling water for chocolate molds, recycled through cooling towers ?
Biscuit production line	- What happens to solid waste (paste) remaining in the mixer ? - Is there any air pollution problem during dough preparation? - Is there any violation of workplace condition at oven? - When does equipment and floor washing occur?
Wafer production line	- Does dough preparation generate air pollution? - Check for heat at cooking oven and make measurements if necessary - Is cooling water for cream preparation, recycled through cooling towers ? - When does equipment and floor washing occur ? - What happens to solid waste generated from wafer cuttings ?
Tahini and Halawa production line	- Do you observe any dust particles during sieving and centrifugation ? - Is there any violation in work place during milling and roasting? - Is there any solid waste generated from centrifugation ? - When does equipment and floor washing occur ?
Toffee production line	- Check for heat generation at cooking oven - Check for noise at roller mill - What happens to solid waste generated from wrapping and packaging? - When does equipment and floor washing occur ?

Bread and Cakes production line	- Are there any losses or spills during mixing ? - Check for heat generation from cooking oven ? - When does equipment and floor washing occur ?
For all lines	- Check for steam leaks, which affect humidity and temperature of the work environment. - Check for losses during packaging and spill prevention measures. - Check for noise near packaging machines and compressors in refrigeration units. - How is solid waste managed? Is it washed down to the sewer? This housekeeping practice increases the pollution load in the effluents.

Service Units

Water treatment units	- If chemicals and coagulants are used, such as lime, alum and ferric sulfate, inorganic sludge will be generated. Check the amount and method of disposal. - In case of ion-exchange units and reverse osmosis the effluent wastewater will be high in dissolved solids.
Boilers	- Check the height of the chimney in relation to surrounding buildings. - Perform flue gas analysis if mazot is used as fuel or if suspicious about results of analysis presented by facility management in the opening meeting. - Check for fuel storage regulations and spill prevention.
Cooling towers	- The amount of blowdown from the cooling towers is about 10-15% of the make-up water and is low in BOD and high in TDS.
Refrigeration systems	- Check the type of refrigerant. - Check amount of cooling water (open or closed cycle)
Garage, and Workshops	- Check for noise and take measurements if necessary. - Check solid waste handling and disposal practices. - Check for spent lube oil disposal method. Ask for receipt if resold.
Storage facilities	- Check storage of hazardous materials and fuel as per Law 4. - Check spill prevention and containment measures for storage of liquids.

WWTP

- Check for sludge accumulation and disposal.
- Analyze the treated wastewater.

Effluent Analysis

Receiving body

- The nature of the receiving body determines the applicable laws.
- Check if effluent discharge is to public sewer, canals and Nile branches, agricultural drains, sea or main River Nile.
- Accordingly, define applicable laws, relevant parameters and their limits.

Sampling

- A composite sample must be taken from each final disposal point over the duration of the shift or a grab sample at peak discharge. Each sample will be analyzed independently.
- According to legal procedures in Egypt, the effluent sample is spilt and one of them is sealed and kept untouched.

9.3 Ending the Field Visit

When violations are detected a legal inspection minutes of meeting is prepared (this is included in GIM (EPAP 2002) annex- J) stating information pertaining to sampling location and time. Violations of work environment regulations should also state location and time of measurements. Other visual violations such as solid waste accumulation, hazardous material and waste handling and storage, and material spills should be photographed and documented. It is preferable that the facility management signs the legal report, but this is not a necessary procedure.
A closing meeting with the facility management can be held to discuss findings and observations.

Note to inspector:

- *Violations, which are suspected by the inspectors, should not be discussed during the closing meeting.*

10. Conclusion of the Field Inspection

The activities performed during the site inspection are essential for preparation of the inspection report, for assessing the seriousness of the violations, for pursuing a criminal or civil suit against the facility, for presenting the legal case and making it stand in court without being contested, and for further follow-up of the compliance status of the facility.

10.1 Preparing the Inspection Report

An example of an inspection report is included in Annex (K) of the General Inspection Manual GIM (EPAP, 2002). The inspection report presents the findings, conclusions, recommendations and supporting information in an organized manner. It provides the inspectorate management with the basis for proposing enforcement measures and follow-up activities.

10.2 Supporting the Enforcement Case

Many issues may be raised and disputed in typical enforcement actions. Enforcement officials should always be prepared to:

- Prove that a violation has occurred. The inspector must provide information that can be used as evidence in a court of law.
- Establish that the procedures were fairly followed.
- Demonstrate the environmental and health effect of the violating parameter.

10.3 Following-Up Compliance Status of Violating Facility

After performing the comprehensive inspection and detecting the violations the inspectorate management should:

- Decide on the sanctions and send the legal report to the judicial authority.
- Plan routine follow-up inspections. This type of inspection focuses on the violating source and its related pollution abatement measure. Self-monitoring results are reviewed during the visit.
- Follow-up the enforcement case (legal department).

Annex (1)

Inspection Checklist for Confectionary Processing Facility

Ministry of State for Environmental Affairs
Egyptian Environmental Affairs Agency
Basic Data Sheet

Date of visit:……. Visit number:…….

Facility name:……

Commercial name:…….

Licensed Activity:……... Days off:……

Legal status:……

Address of facility

Area of facility:…… Governorate:…….

City:…… Zone:…….

Phone no. :…… Fax no.:…….

……... …….

Year of operation :…….. Postal code:……

The Facility Representative:……..

Environmental management representative:…….

Chairman/Owner:……

Address of Administration

e-mail:……..

Phone no. :…… Fax no.:…….

……... …….

The industrial sector:……

No. of male employees: …… No. of female employees:……

Do they work in production …….

Total no. of employees: …….

Number of shifts/day:…….……shifts/day

Duration of shift:…….…hrs/shift

Environmental register:…….. Hazardous waste register:…….

EIA:…….. Self monitoring:…….

Nature of Surrounding Environment

Industrial ❑	Coastal ❑	Coastal/ Residential ❑
Industrial/ Residential ❑	Residential ❑	Agricultural ❑
Agricultural/ Industrial ❑	Agricultural/ Residential ❑	Desert ❑

Ministry of State for Environmental Affairs
Egyptian Environmental Affairs Agency
Basic Data Sheet

Power Consumption

Electricity ❑ Fuel ❑

Electric power: ……...kWh/(day-month-year)

Type of fuel	Fuel consumption	
Mazot	…….	Ton/(day-month-year)
Solar	…….	Ton/(day-month-year)
Natural gas	…….	Ton/(day-month-year)
Butagas	…….	Ton/(day-month-year)
Other ….	…….	Ton/(day-month-year)

The GPS (Global Positioning System) reading for Gaseous Emissions

1- LAT(Latitude):..……. LONG(Longitude):…….
2- LAT(Latitude):…… LONG(Longitude):…….
3- LAT(Latitude):…… LONG(Longitude):…….

Production

Product	Quantity/ (day-month-year)
……	……
……	……
……	……
……	……
……	……
……	……
……	……
……	……
……	……
……	……
……	……

Water Supply

Artesian well ❑ Municipal water ❑ Treated water ❑ Nile water ❑

Canal water ❑ Other…….. ❑

Ministry of State for Environmental Affairs
Egyptian Environmental Affairs Agency
Basic Data Sheet

Water Consumption

Amount of water consumed in operation (day-month-year):

Process ……..m^3/ Boilers……..m^3/

Domestic usage……....m^3/ Cooling……....m^3/

Other…….. …….m^3 /

Total amount of water consumed (day-month-year)…… ……..m^3/

Type of waste water:
Industrial ❑ Domestic ❑ Mixed ❑

Wastewater Treatment:
Treated ❑ Untreated ❑

Type of Treatment:
Septic tanks ❑ pH adjustment ❑ Biological treatment ❑
Chemical treatment ❑ Tertiary treatment ❑

Amount of treated water/ (day-month-year)……..m^3 /
Amount of waste water/(day-month-year)…….m^3 /

Final wastewater receiving body:
Nile ❑ Lakes (fresh water) ❑ Drain ❑
Groundwater ❑ Public sewer system ❑ Canals❑
Agricultural Land ❑ Desert Land ❑ Other……❑

The Global Positioning System(GPS) reading for final disposal
1-LAT(Latitude):……. LONG(Longitude):…….
2-LAT(Latitude):……. LONG(Longitude):…….

Engineering Drawings for the Facility
Gaseous emissions map Yes ❑ No ❑

Sewer map: Domestic ❑
Industrial ❑
Mixed ❑
Factory Layout ❑
Production process flow diagram ❑

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Raw material consumption

No.	Trade name	Scientific name	CAS no.	UN no.	Physical state	Type of container	Amount	Classification	
								Hazardous	Non-Hazardous

Inspection Team Member:

Team member	Position

Date: Inspector signature:

Checklist for Chocolate and Powdered Chocolate Drink Production Line

1. General	
1.1 The housekeeping status Floor condition Wash water leaks Piling of solid waste	 ---------- ---------- ----------
1.2 Make sure the all units of the production line are operated	----------
1.3 Type of operation	☐ Batch ☐ Continuous
1.4 Amount of raw material processed per day and per shift	---------- ---------- ----------
2. Status of the Work Environment	
2.1 Are there noise in the workplace	☐ Yes ☐ No
2.2 How long does the employee exposed to noise ?	---------- ----------
2.3 Does the facility have noise measurements	---------- ----------
2.4 Check for heat from roasting step	---------- ----------
Note : If suspicious, measure noise and/or heat	
3. Status of Effluents (Wastewater)	
3.1 Is cocoa dust settling on the floor, washed to the gutters ?	☐ Yes ☐ No
3.2 When during the shift is equipment & floor washing performed ?	----------
3.3 How much rinse water is used for equipment and floor washing ?	----------

Check list for Biscuits Production Line

1. General	
1.1The housekeeping status Floor condition Wash water leaks Piling of solid waste Leaking steam	 ---------- ---------- ---------- ----------
1.2 Make sure that the production line is operated	----------
1.3 Type of operation	☐ Batch ☐ Continuous
1.4 Amount of raw material processed per day and per shift	---------- ---------- ---------- ----------
2. Status of the Work Environment	
2.1 Check for noise and heat stress in the workplace	----------
2.2 If there is noise, How long does the employees expose to noise ?	----------
2.3 Does the facility have a noise measurement and /or heart stress record	----------
2.4 Are there air pollution problem from flour particles in the sieving and mixing step	☐ Yes ☐ No
2.5 If there is an air pollution problem. Is there a ventilation system in place ?	☐ Yes ☐ No
<u>If yes</u> Is the ventilation system operating	☐ Yes ☐ No
Note : If suspicious perform your own	
3. Status of Effluents (Wastewater)	
3.1 Check for the wastewater in the inspection manhole	----------
3.2 When during the shift is equipment & floor washing performed ? 3.3 How much rinse water is used for equipment and floor washing ?	☐ Yes ☐ No ----------
3.4 If there is dough on the floor, is it washed down to the sewer	☐ Yes ☐ No
4. Status of Solid Waste	
4.1 What happens to solid waste generated from out-of-spec biscuits and returned unsold biscuits	---------- ----------

Checklist for Halawa and Tahini Production Line

1. General	
1.1 The housekeeping status Floor condition Water leaks Piling of solid waste	 ---------- ---------- ----------
1.2 Make sure that the production line is operated	----------
1.3 Type of operation	☐ Batch ☐ Continuous
1.4 Amount of raw material processed per day and per shift	---------- ---------- ----------
Note : Pesticides could be used to eliminate flies and other pests	
2. Status of the Work Environment	
2.1 Are there noise in the workplace from milling step	☐ Yes ☐ No
2.2 Check the exposure time	----------
2.3 Does the facility have noise measurements	☐ Yes ☐ No
2.4 Check for heat stress from roasting step	----------
2.5 Are there an air pollution problem in the work place from sieving and centrifugation step	☐ Yes ☐ No
Note : If suspicious, measure noise and/or heat stress	
3. Status of Effluents (Wastewater)	
3.1 When during the shift is equipment & floor washing performed ?	----------
3.2 How much rinse water is used for equipment and floor washing ?	----------
4. Status of Solid Waste	
4.1 What happen to solid waste produced from centrifugation step	----------
4.2 What happens to solid waste (plastic containers) produced from packaging step ?	----------

Check list for Toffee Production Line

1. General	
1.1The housekeeping status Floor condition Wash water leaks Piling of solid waste Leaking steam	 ---------- ---------- ---------- ----------
1.2 Make sure that the production line is operated	----------
1.3 Type of operation	☐ Batch ☐ Continuous
1.4 Amount of raw material processed per day and per shift	---------- ---------- ----------
1.5 What happens when an out-of- spec batch is produced ?	----------
2. Status of the Work Environment	
2.1 Check for noise from the roller mill	----------
2.2 If there is noise, How long does the employees expose to noise ?	----------
2.3 Does the facility have a noise measurement and /or heat stress record	☐ Yes ☐ No
2.4 Check for heat from cooking step	----------
Note : If suspicious perform your own	
3. Status of Effluents (Wastewater)	
3.1 Check for the wastewater in the inspection manhole	----------
3.2 When during the shift is equipment & floor washing performed ? 3.3 How much rinse water is used for equipment and floor washing ?	---------- ---------- ----------

Checklist for Boilers and Water Treatment Units

1. General	
1.1 Boiler number and capacity	---------- ---------- ---------- ----------
1.2 Type of fuel used for boilers In case of using mazot for boilers Is it a dwelling zone Note :	❑ Mazot ❑ Solar ❑ Yes ❑ No
Note : The use of mazot as fuel in the dwelling zone is Prohibited by law.	
1.3 What is the method used for water treatment	❑ Lime method ❑ Ion exchange ❑ Reverse osmosis
2. Status of Air Pollution	
2.1 What is the height of the chimney	----------
Note : the height of the chimney must be 2.5 times the height of adjacent buildings.	
2.2 If mazot is used in non dwelling regions, or smoke is detected	Are there analyses of the flue gases for sulfur dioxide, carbon monoxide, and particulate matter ❑ Yes ❑ No <u>If Yes</u> Are they enclosed in the environmental register ❑ Yes ❑ No <u>If No</u> Ask for preparation of these records and their inclusion in the environmental register
Note : Perform analysis, if necessary	
3. Status of Effluent	
3.1 What is the blow down rate from the boilers	---------- m^3/d
3.2 What are the blow down and back wash rates for the treatment units	---------- m^3/d
3.3 Steam condensate is	❑ Recycled to the boiler ❑ Discharged to sewer

4. Status of Solid Waste	
4.1 If the lime method is used, sludge is generated. What is the amount of sludge produced per day	----------
4.2 What is the sludge disposal method	----------
5. Storage and Handling of Hazardous Material	
5.1 Check the storage of chemicals used in the treatment process. Is it in compliance with law 4 ?	❑ Yes ❑ No
5.2 Is there any fuel leaks from fuel tanks	❑ Yes ❑ No
5.3 Is there any fire extinguishing devices and equipment	❑ Yes ❑ No
5.4 Is there a spill prevention plan	❑ Yes ❑ No
5.5 Do you notice anything that can provoke a fire? Such as the presence of a pump underneath the fuel tank (the start-up of the engine can produce a spark)	❑ Yes ❑ No Comment ---------- ---------- ----------
6. Status of Work Environment	
6.1 Check the noise next to the boilers	----------
6.2 Check the heat stress next to the boilers	----------
6.3 Are there any existed measurements? Are they included in the environmental register?	❑ Yes ❑ No ❑ Yes ❑ No

Checklist for Cooling Towers and Refrigeration Systems

1.General	
1.1 Number and capacity of cooling towers	---------- ---------- ----------
1.2 Cooling tower make-up rate Note : Blow down = 10-15% of make-up	Rate ---------- Blowdown ----------
1.3 What is the type of refrigerant used in the refrigeration system	☐ Ammonia ☐ Freon ☐ Others
1.4 If Freon is used which is prohibited by the law, is there a possibility for replacement	☐ Yes ☐ No
2. Status of Work Environment	
2.1 Measure the noise next to the compressors of the refrigeration unit	Result ---------- ----------
2.2 Check the exposure time	----------
2.3 Do you smell ammonia odor If yes perform analysis to check compliance	☐ Yes ☐ No
3. Status of the Effluent	
3.1 Cooling water for the compressors is performed in	☐ Open Cycle ☐ Closed Cycle
Note : If performed in open cycle it will dilute the final effluent	
3.2 Record the amount of open cycle cooling water of the refrigeration system	----------
4. Status of Solid Waste	
4.1 What is the disposal method for stored products that get spoiled for any problem in refrigeration	---------- ----------

Checklist for Garage

1. General	
1.2 Is there any detergent or solvent used for washing equipment parts, trucks, floor,….etc	☐ Yes ☐ No
1.3 What is the amount of oil and grease used per day?	----------
1.4 What is the amount of spent lube oil produced per day ?	----------
1.5 How does the facility dispose of the spent oil ?	----------
2. Status of the Effluent	
2.1 What is the amount of wastewater produced ?	----------
2.2 Do you observe any oil / foams / solid matter in the inspection manhole ?	☐ Yes ☐ No

Checklist for Workshops

1. Status for the Effluent	
1.1 What is the amount of wastewater produced ?	----------
1.2 What is your visual observation for the inspection manhole of the workshop ?	----------
2. Status of solid waste	
2.1 What is the amount of solid waste produced	----------
2.2 How does the facility get rid of the solid waste produced ?	----------
3. Status Of the Work Environment	
3.1 Are there any noise in work place If yes 3.2 Are there any measurements for noise 3.3 Check the exposure time If not Perform measurements	☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ----------

Check list for Laboratories

1. General	
1.1 What is the amount of wastewater produced per day	----------
1.2 List the chemicals and materials used in the laboratories	---------- ---------- ----------
2. Status of the work Environment	
2.1 Are there any odor/ gases/noise in the work environment	☐ Yes ☐ No
2.2 Check the exposure time	----------
3. Handling of Hazardous Material	
3.1 Inspect storage of hazardous material. Is it in compliance with the requirements of law 4	☐ Yes ☐ No
3.2 Are there any first aid measures in place	☐ Yes ☐ No

Checklist for Wastewater Treatment

1. General	
1.1 What is the capacity of WWTP	----------
1.2 Specify the units included in WWTP :	
Pumping station	☐ Found ☐ Not found
Equalization tank	☐ Found ☐ Not found
Aeration tank (ditch or channel)	☐ Found ☐ Not found
Final sedimentation tank	☐ Found ☐ Not found
Sludge thickening tank	☐ Found ☐ Not found
Sludge drying	☐ Found ☐ Not found
Others	----------
1.3 List any chemical and their quantity used for wastewater treatment	---------- ---------- ---------- ---------- ----------
2. Status of Effluent	
2.1 Are there analyses for the effluent If not Make your own	☐ Yes ☐ No
2.2 Are the results of the analysis included in the environmental register	☐ Yes ☐ No
3. Status of Solid Waste	
3.1 Determine the sludge disposal method	----------
Note : It can be use in liquid or dry form, in agriculture	
If a third party is involved in disposal, get documents for proof	☐ Found ☐ Not found Comment ---------- ----------