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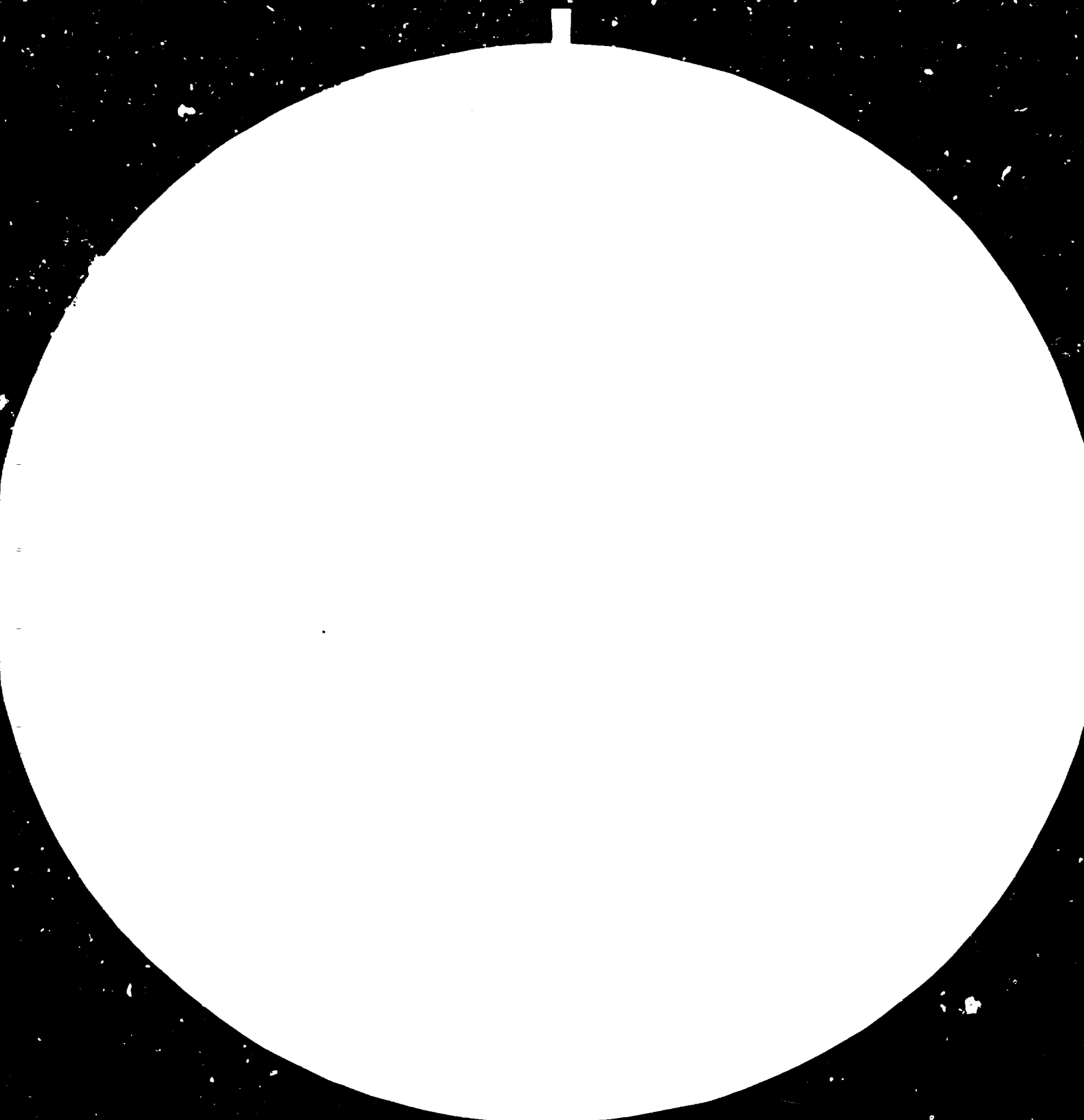

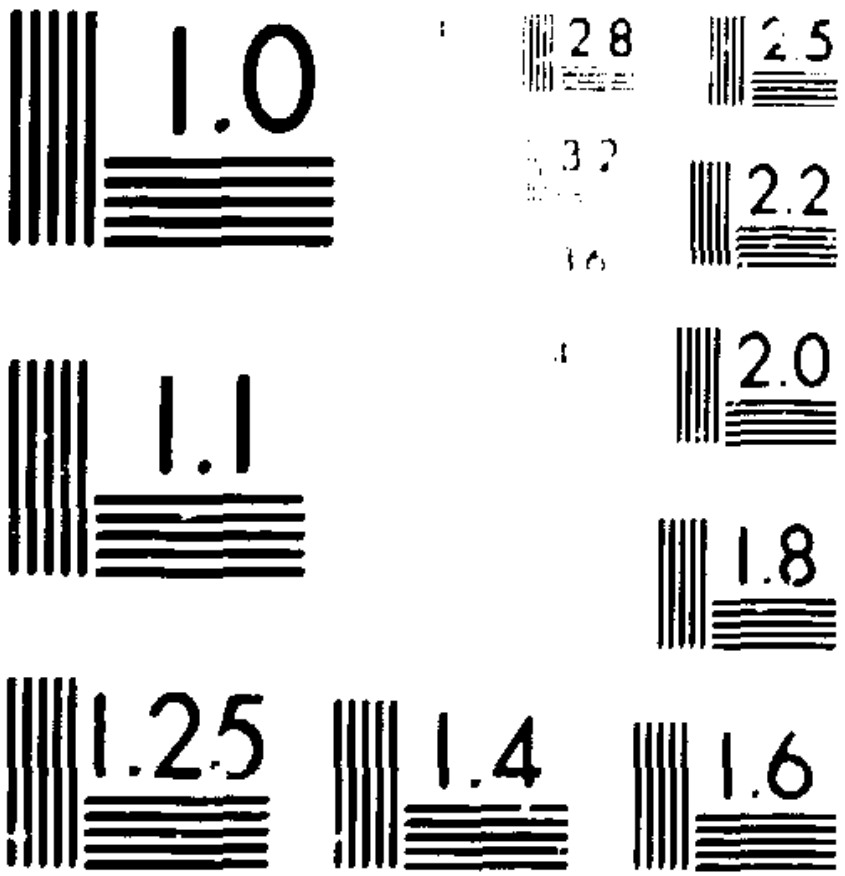

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DP/ID/SER.A/387
12 October 1982
English

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CONSOLIDATION OF THE MEXICAN INSTITUTE FOR ASSISTANCE TO THE INDUSTRY

DP/MEX/82/010

MEXICO.

Technical report: Food processing training (canning)*

Prepared for the Government of Mexico
by the United Nations Industrial Development Organization,
executing agency for the United Nations Development Programme

Based on the work of Ramon Catala, Consultant in
food processing training (canning)

United Nations Industrial Development Organisation
Vienna

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CONTENTS

1. SUMMARY

The new cooperation project of the United Nations Industrial Development Organization with the Mexican Government, related to the Laboratorios Nacionales de Fomento Industrial -(LANFI)-, has as its main objective the Research and Development of Processed and Packaged Food Technology.

The first effort is the identification of problems and the establishment of the working program. On this subject the project has been collaborating with LANFI technical personnel. Talks with responsible people in the working areas of LANFI and with the technicians of the manufacturing industries of packaging and food manufacturers have shown that there is a good potential for canned products, especially fruits, vegetables and sea foods, as one of the most interesting alternates for the development of the Mexican Food System (Sistema Alimentario Mexicano).

For the adequate development of the canning technology in Mexico, more attention must be given to the study related to selecting industrial raw materials, the optimization of the processes, the quality control of raw materials and finished products, as well as to the package-product interaction problems. LANFI can play an important role in developing the canning industry in Mexico.

At present, LANFI has worked mainly on package-product interaction problems, starting a study concerning the quality of canned foods with special emphasis on quality of cans in Mexico. The experimental work has been done during the last year by the Metal Containers Group following the plan proposed by me during last year's mission. The results were discussed with the group and suggestions were made concerning the report.

Results obtained gave very interesting information concerning the situation in the Mexican canning industry showing several problems

that must be studied further. Three new research projects were prepared to be carried out by LANFI personnel in the coming year.

Additionally, other complementary activities were undertaken **inclusive** , review of some analitical techniques, the participation in a 3 days seminar for industrial technicians about "Tinplate Containers for Food Industry", as well as several internal seminars for the LANFI personnel, on specifical subjects of canning technology.

2. INTRODUCTION AND JOB DESCRIPTION

In 1972 the agreement basis between the Mexican Government and the United Nations Industrial Development Organization (UNIDO) were established to create the 'Instituto Mexicano del Envase y Embalaje" (IMEE), organism dedicated to the study, information, training, technical assistance, research and programming of the development of packaging in Mexico.

In April 1977 the IMEE was succeeded and integrated by the "Instituto Mexicano de Asistencia a la Industria" (IMAI)

In April 1981 the IMAI and its personnel, equipment and budget were integrated to the "Laboratorios Nacionales de Fomento Industrial" (LANFI) due to the industrial development policies and as a result of the Administrative Amendment, reform that is looking for a more efficient public sector. LANFI is a public descentralized organism dedicated to research and development as well as to provide assistance to the industry in the areas of packaging, food and chemical products.

Because of the Mexican Government needs and the LANFI structure, the IMAI Consolidation Project will continue with major extent, concentrating its activities in two main areas, food processing and packaging. The new project is called: MEX/82/010 Research and Development of Processed and Packaged Food Technology.

Generally the purpose of this project is to collaborate with the Mexican Government programs, by participating with technical support in the areas of food and packaging processing and technology.
Some of the objectives of this project are: to develop the maximum advantages of food resources, to make process criteria homogeneous, to diffuse the use of packaging technology, to participate in elaborating new standards and in industrial training in the areas of food and packaging.

Within the above project I was assigned according to the following job description.

Job Description

Post title	Consultant in food processing training (canning)
Duration	One and a half month
Date required	July-August 1982
Duty station	Mexico City, with travel as required

Duties

The expert will be assigned to the National Laboratories for Industrial Development - LANFI and will be expected to:

1. Follow up the food processing program of LANFI in the area of canning technology

2. Guide and train counterpart personnel in the area of canned food products, within the programmes of LANFI and the Mexican Government

3. Help LANFI personnel in the set up of the Food Processing Pilot Plant with special emphasis to the canning line.

4. Give lectures in the food processing subjects and train personnel in methods of process and product evaluation

5. Visit the food industries together with LANFI personnel in order to train this group in this area

6. Participate in an industrial seminar in LANFI.

The expert will also be expected to prepare a final report, setting out the findings of his mission and recommendations to the Government on further action which might be taken.

According with the Mexican counterpart, it was decided to review my job description initially foreseen. First of all, it was necessary to deepen the work already done by other experts and by myself, in the past year, with the Metal Containers Group. I was also requested to collaborate in the discussion of different projects in the Food Processing area with the LANFI managers.

The following new Job Description was established, previously authorized by the Resident Representative of UNIDO in Mexico.

Job Description

1. Follow up the food processing program of LANFI in the area of canning technology.
2. Prepare and present some internal seminars for LANFI personnel about specific topics related to canned foods.
3. Study and evaluate the results of the project "Quality and compatibility evaluation of food metal packages and canned foods manufactured in Mexico", developed by LANFI staff in 1981.
4. Prepare new research project for LANFI staff, in order to study the specific problems of corrosion in canned foods of major interest for mexican industry.
5. Train personnel in new techniques of evaluation of quality of metal packages
6. Visit food industries together with LANFI personnel in order to train this group in this area.
7. Participate in two seminars intended for the mexican industry.

3. DESCRIPTION OF WORK PERFORMED

According to the Job Description the following activities were developed.

3.1 Study the results of the research project performed by the Metal Containers Group, during the last year.

With the purpose to consolidate and complement the knowledge developed by the Metal Containers Group during my previous stay, a research project was programmed: "Evaluation of Quality and Compatibility of Food Metal Containers made in Mexico". The main objectives of this project were:

1. To assess the present situation of the metal containers and canned foods packaged by Mexican Industries, especially as related to production, quality control and common problems.

2. To evaluate the quality of the cans and their compatibility with foods made in the Mexican Industry.

3. To study the food-packaging interaction of some foods of interest to the Mexican Industry. (See Annex IV last year's Catala report - DP/MEX/82/010/11-09/C/31.7.E)

During the past year the work of the first two steps of the planned programs were carried out and the results were waiting for my arrival. It was necessary, due to their inexperience, to train the personnel in interpreting the results of the investigations and to assist them to prepare the technical reports.

Four reports, of the results obtained, containing the following titles were edited:

- Quality evaluation of the metal containers manufactured in Mexico.

- Internal corrosion of canned sea-food made by the Mexican Industry.

- Internal corrosion of the canned vegetables made by the Mexican Industry

- Quality evaluation and corrosion problems of metal containers in Mexican canned foods.

The first three reports are related to partial aspects of the project and will be presented in several technical meetings. The last one will be the compilation of the entire work and will include statistical information on the subject. This will be published by LANFI as an informative pamphlet for Mexican Industry. Annex I shows how to make that pamphlet.

3.2 Research project proposals.

The results obtained in the research project mentioned above gave us information about the quality of the metal containers available in the country, and established certain problems of corrosion which are interesting for further study as was foreseen in the initial project.

Thus, it seems necessary to plan new research projects to deepen the study of some of these problems and get the information required to improve quality of the foods processed by the Mexican Industry.

Among the different problems to be studied in order to get the above mentioned results, the following are the most important:

- Corrosion problems in canned "chile"
- Reducing the high levels of lead in the canned vegetables and marine products.
- Investigate several containers (i.e. cans and flexible) for the packaging of sea food.

For this purpose three new research projects were proposed. See diagrams in Annex II.

3.3 Training in Analytical Methods

LANFI's Metal Containers Group has available the necessary equipment to carry out quality control of metal containers. Its personnel is acquainted with most techniques and is able to carry them out satisfactorily. However, there were some doubts and deficiencies concerning some tests, and these were reviewed:

The techniques reviewed were:

ATC test

A new electrical circuit board was prepared for the performance of the test, following my own design, and consistant results were obtained.

3.4 Internal Seminars for LANFI Personnel

Several internal seminars concerning specific aspects of canning technology were presented.

Five seminars, of two hours each, were given on the following subjects:

- Shelf-life evaluation of canned foods
- Influence of food components on the rate of corrosion of metal containers.

- Present situation of the lacquers for food cans

- Advantages and disadvantages of the metal, glass and plastic containers for packaging food.

- Electrochemical techniques to study corrosion problems in metal containers.

3.5 Seminar for Technicians from Industry

During my stay at LANFI, a seminar for technicians from the Mexican Industry was programmed with the title: "Tinplate Containers for Food Industry". This seminar was held in Querétaro, Qro. Mexico, from June 21 to 23 according with the program shown in Annex III.I

I participated in this seminar with three lectures, two of them were about technical subjects and the other one was concerned with the state of the art of metal containers in the international markets.

The last one was prepared especially for this seminar and contained information not presented before;for this reason I am including this lecture in Annex III.2

A seminar on processed and packaged sea-foods had also been planned for presentation in Ensenada, Baja California, Mexico, from July 26 to 29 but, for administrative reasons, it was cancelled. My participation should have been with two lectures.

3.6 Visits to Industry.

Several industries related to the manufacturing of containers and of foods were visited.

These visits were planned with the double purpose to complement the technological knowledge of LANFI staff, being trained in the establishment of industrial relations, as well as to learn more about the Mexican industrial problem, so as to be able to give better service to the industry in the future. Annex IV shows the visits to the industry as well as names of people contacted.

These visits and the contact with technicians of several food industries led us to the following conclusions:

- The production of tin plate in Mexico (180,000 tons in 1981) does not cover the necessities of the country (450,000 tons), making imports necessary.

  National production is involved in producing only few types of tinplate and in the opinion of the users with great variations in quality.

- In the manufacture of containers high technology with new and well planned facilities with a good level of quality control is available. One of the major problems is the acquisition of suitable materials which must be imported.

- The canning industry does not always have the most suitable container for each product to be packaged and generally their quality control is very low. Also, they do not have enough information concerning the problems of product-package interaction in metal containers.

- The canning industry needs technical help and it should be informed about the LANFI activities related to metal containers.

3.7 Collaboration in the discussion and evaluation of LANFI projects.

Being requested by the LANFI managers I participated with the LANFI personnel in the discussion and evaluation of projects in different areas of food technology, as follows:

a. Projects reviewed.

. Proposal presented by the Laboratorios Nacionales e Fomento Industrial to advice on the design of a guava fruit-pulp manufacturing plant.

. Proposal to study the elaboration of standards for packages for fresh fish and fresh sea food.

Comments and recommendations to both projects were well received and were incorporated to them.

b. Discussion of the necessity to investigate the canned foods.

Based on several talks with LANFI personnel and industrial technicians, a general opinion was established about the prospects of preserved foods as an important component in the Sistema Alimentario Mexicano (SAM).

It is necessary that LANFI takes special interest in this technology, especially with fruits, vegetables and sea foods. The research resources for these products should be increased by enlarging the working areas in the following aspects:

- Selection of raw materials. Raw materials suitable to be industrialized with higher yields and better quality

- Optimization of manufacturing techniques, specially related to conditions for thermal treatment

- Quality control of raw materials and manufactured products as regards sensoric and nutritional aspects.

- Development of standards of identity and quality for manufactured products.

With all these working areas and the studies presently being developed concerning the product-package interaction and the selection of suitable containers, LANFI could contribute to the development of an advanced canning industry in Mexico.

4. CONCLUSIONS AND RECOMMENDATIONS

4.1 The strengthening of the new structure of the LANFI organization for the fulfilment of the research and development program concerning food processing and packaging demands a deeper know-how in the different subjects involved.

The personnel, in general, have a good theorethical background and it is recommended to give special attention to the practical application of this knowledge, through research projects or by solving industrial problems.

It is recommended to carry out three new research projects (Annex IV), one of them to be developed by the Metal Containers Group and the other two are multidisciplinary projects so as to get integration of the various groups working in foods and packaging.

While working in their own projects, LANFI personnel must intensify efforts to get sponsored projects from industry, so as to acquaint LANFI with the industrial reality.

4.2 The Metal Containers Group personnel have a good level of know-how in packaging technology and quality control. However, they have little knowledge in food physical-chemistry and in preservation technology, thus reducing their efficiency in solving practical problems.

It is recommended to give special attention to their advanced education in these subjects. It is also recommended to extend the food working group personnel know-how on metal containers.

The proper knowledge in the different subjects will permit the establishment of the multidisciplinary approach to solve problems.

4.3 It is necessary to consider the possibility to promote the further education of the members of the working groups through master degrees in specialized laboratories abroad, in places where advanced technology in areas of LANFI activities is available.

Additionally, it is recommended that the personnel of the working groups will stay for short period of times in industries with high technical levels in order to acquire a better knowledge of the industrial problems.

4.4 Visits to industry and talks with technicians of the different tinplate manufacturing packaging and food processing industries showed that the latter need more technical assistance.

The canning industry cannot always get the suitable containers for each product and has few instruments to determine the quality of the packaging materials. It seems appropriate that LANFI intensify its activities in the metal containers area to satisfy the requirements of the food processing industry.

4.5 The work carried out by the Metal Containers Group gave important information on quality of the metal containers manufactured in Mexico and their compatibility with foods, as well as information on the problems concerning the package-product interaction.

Very little information is available on the sensoric quality of canned foods in Mexico and factors affecting it.

Therefore, it is recommended to study these aspects in the near future.

4.6 Based on the opinion of industrial technical personnel, canned foods have a special place within the Sistema Alimentario Mexicano with excellent growing prospects in the future.

Thus, it is recommended that LANFI gives special attention to this technology, especially related to fruits, vegetables and sea foods.

In my opinion, it would be necessary to increase the resources for investigation of these products, enlarging research subjects to include selection of raw materials for the industry, optimization of the manufacturing processes and quality control of raw materials and manufactured products. With these new projects and those being carried out at present on package-product interaction, LANFI should be able to contribute to the development and improvement of the canned food industry in Mexico.

ANNEX I

Guide to elaborate the report of the project: "Evaluation of quality and compatibility of food metal containers made in Mexico".

1. Introduction

1.1 Product-package interaction problems in canned foods.

- Statistical information of canned foods in Mexico. Production of tinplate, packages and canned foods.
- Corrosion problems - Fundamentals and consequences.
- Lack of information concerning problems in the Mexican industry.

1.2 Objectives
(according to project)

2. Experimental

2.1 Research plan
(As in project)

2.2 Materials.

2.2.1 Tinplate (number of samples, supplies, etc.)

2.2.2 Containers (number of samples, types, suppliers, etc.)

2.2.3 Canned products (number of samples, origin, dimensions, label information.

2.2.3.1 Fruits and vegetables

2.2.3.2 Sea foods

2.3 Analytical methods

2.3.1 Tinplate

2.3.1.1 Tin coating (free and alloy layers)

2.3.1.2 Tin crystal size
2.3.1.3 Type of lacquer
2.3.1.4 Film thickness

2.3.2 Containers (empty)

2.3.2.1 Dimensions
2.3.2.2 Seams

2.3.3 Canned products

2.3.3.1 Net weight and drained weight
2.3.3.2 Vacuum
2.3.3.3 Organoleptical evaluation
2.3.3.4 Degree of corrosion in the container-visual
2.3.3.5 Heavy metals content

3. Results and Discussion

3.1 Tinplate and containers

3.1.1 Tin coating
3.1.2 Lacquer
3.1.3 Characteristics of the can

3.2 Canned products

3.2.1 Vegetables

3.2.1.1 Can characteristics
3.2.1.2 Quality of canned products
3.2.1.3 Degree of corrosion
3.2.1.4 Tin, iron and lead content in packaged products

3.2.2 Sea foods

3.2.2.1 Can characteristics
3.2.2.2 Canned product quality
3.2.2.3 Degree of corrosion
3.2.2.4 Tin, iron and lead content in packaged product

4. Conclusions

5. Bibliography

ANNEX II

Scheme of the proposed research projects

The scheme of the working plan of the three proposed research projects is included. The detailed plan should be established by the personnel in charge of it.

PROJECT

Title: Study of the product-package interaction problems and optimization of the technological process for the preservation of chiles

Objectives

1. To study the general characteristics and the internal corrosion mechanism of canned "chile"
2. To establish the changes of the sencoric characteristics of the packaged "chile" products
3. To improve the technological process selecting a suitable container to obtain an improved product and reduce to minimum the container - product interaction.

Justification

Canned "chile" in different forms of preparation are a typical Mexican product, widely used by the entire population. These products are in the first place of the Mexican canned foods. They satisfy the national demand and their exportation to USA, France, Spain and other countries is growing rapidely.

The major part of the preserved "chiles" are presently packed in tinplate containers, with severe technological and economical problems. From the economic aspect the tin can presents a high cost of the final packaged product. From the technological aspect there are frequent corrosion

problems in these containers, due to inadequate specifications of the containers used, as was seen in studies carried out by LANFI.

LANFI has some information concerning the technological problems regarding these products, however, studies developed until now have been dedicated only to partial aspects of the problem.

It is very important to perform a thorough experimental study taking into consideration all the different problems that "chile" preserves have.

Description of the Project

It is intented to study the following factors:

Product: Variety of "chile"
Jalapeños (entire or in slices)
Serranos (entire)

Preparations
Vinegar
Pickled

Containers: Tin plate
E. 11, 2/11.2 plain
E. 5,6/11.2 lacquered
E. 5,6/11.2 lacquered

Glass (jars with twist-off caps)

Flexible pouch with aluminium
PET/PP
PET/PVC/PE

Processing: Vacuum
mechanical
thermal

Headspace (only in cans)
without
6-8 mm

Storage: Temperature
environment (23° C and 50% HR)
tropical (35° C and 80% HR)

Time
See further

By combining above variants, the parameters of the different lots will be selected. This selection will be done by adequate statistical design to get the information required.

Preparation of samples

Since each different container needs different processing technology, preparation must be done separately, but using same raw materials and similar working conditions.

It is advisable to prepare samples in an industrial facility or under conditions simulating those existing in industry, to obtain more representative results.

Samples will be prepared according with the parameters statistically established, and will be stored at different temperatures for their subsequent analyses during different periods.

Analyses

Samples should be analysed periodically during 24 months at intervals depending on storage temperature.

The evaluation of each kind of preparation will be based on its own characteristics.

In every analytical control, three samples from each lot will be ied using the following determinations:

Canned product:

- Analysis of the gases in headspace
- Vacuum, headspace, not weight and drained weight
- Corrosion degree of the package
- Tin, iron and lead in the product
- General appearance of the product
- Color (Hunter parameters)
- Texture (Instron parameters)
- Flavor (organoleptic)

Product packaged in glass

- Vacuum, headspace, net weight and drained weight
- General appearance of the food
- Color (Hunter parameters)
- Texture (Instron parameters)
- Flavor (organoleptic)

Analyses should be done 4-5 time during 12 months of storage

Products in retort pouch

- Total volume, net weight and drained weight
- General appearance of the food

- Color (Hunter parameters)
- Texture (Instron parameters)
- Flavor (organoleptic)
- Migration

Analyses should be carried out periodically 4-5 times during at least 6 months.

Prior to the preparation of the samples, a complete analysis must be done on the packages and raw materials. Thus, for reference sample, regarding color, a raw material sample must be stored, packaged in amber glass and frozen at -18° C. Furthermore, a complete analysis must be carried out on the processed product at zero but should not be repeated during storage.

It is recommended not to carry out unnecessary periodic analyses and perform tests from the different storage temperatures not at the same intervals.

PROJECT

Title: Study of the reduction of lead in Mexican canned foods.

Objectives

1. To determine the origin of the elevated lead content in Mexican canned food.

2. To establish the necessary steps required to reduce lead content in Mexican canned foods to comply with international legislation.

Justification

Lead is an element widely distributed in nature, it can be found in foods as a natural component or as pollutiant.

Sources of food pollution by lead are several and are a consequence of the utilization of this element in different industrial activities. It is necessary to regulate this by the necessary technological measures to obtain acceptable levels.

Description of the project

1. Study of lead content in canned products. The following possibilities are proposed to find the sources of the lead content in canned products.

   - Fresh product

     (without any process)

     Empty cans

     Additives, water and other materials used in the canning process.

   Foods preserved in tin cans and glass containers stored for 3 months at a temperature of 35-37° C.

This study should be made using 10 basic products selected as being the important ones. These products are: peas, chiles, asparragous, green-beans, peaches, tomatoes purée, tuna fish, anchovies, sardines and squids.

Both in raw materials and canned food, the lead content will be determined by atomic absorption spectroscopy using a sample preparation by hidrolysis with HNO_3, following the analytical techniques established in LANFI.

From each lot minimum 5 samples of different origin must be analysed. The analyses of the possible migration from the metal containers will be done by extraction with acetic acid and subsequently the determination by atomic absorption espectroscopy.

The study must be extended to samples of packages representing the more extensively used in Mexico. At least 5 cans from each lot must be analysed.

It will be convenient to make the study in cooperation with some manufacturing industries, taking samples of raw materials and also from the different processing steps, as well as of the final product, after 3 months of storage at ambient temperature.

In this way a more realistic information will be obtained concerning the possible pollution sources and especially the responsability of the package on the lead contents of the canned foods.

- Study of the reduction of the lead content in canned food.

  The working plan in this subject must be based in the results obtained in the above described part of this study.

PROJECT

Title: Selection of the suitable containers for the manufacturing sea foods.

Objectives

1. To know the general characteristics and the internal corrosion mechanism of canned sea foods of high consumption and high commercial interest in Mexico.

2. To select the suitable container to get higher quality of the canned foods, limiting to minimum the package-product interaction.

Justification

Mexico, as a developing country has, as one of its main goals, to obtain self sufficiency in foods. SAM was created for this purpose.

Within SAM fish production is considered as one important option. Mexico has a considerable fish production potential from which, at present, only a small percentage is exploited. The administration considers that there are many possibilities to develop marine based foods for the growing population of the country.

At present the major part of the preserved sea foods are packed in tinplate containers.

Industry is using conventional technology and available containers, with several problems of packaged-product interaction. In a LANFI project some canned food quality problems have appeared caused by the use of unsuitable containers. Thus, a thorough experimental study should be undertaken to reduce these problems in fish products.

Description of the project

The main problems of Mexican canned sea foods are sulfur staining of the tinplate, as well as high lead and iron concentration in them.

a. Study of the Sulfur Staining in Model Systems.

It is recommended initially to carry out a study concerning sulfur staining. For this purpose as many samples as possible should be obtained from the can manufacturers. The samples should include tinplate with different characteristics like:

Tin coating

E. 2.8
E 5,6
E 11,2

Passivation treatments of tinplate

normal
high level (0,5 mg Cr/cm^2)

Lacquer

Epoxiphenol lacquer with high phenolic content
Normal epoxiphenol lacquer
Aorilic lacquer

All the tinplates should be analysed for the following characteristics:

- Tin coating
- Chromium in the pasivation layer
- Oxides film
- Tin crystal size
- ATC test (only in plain tin)
- Type of lacquer
- Thickness lacquered film

- Lacquered film adherence
- Lacquered film porosity
- Sulfur staining resistance with model solution of cysteine

b. Study with canned fish products

The more important sea products in Mexico are tuna fish and sardines. Therefore it is recommended to use these for a further study. For each product samples should be prepared with two of the best tin plates found in part a). Fish products should be processed using normal time temperature and a high temperature short time process.

The packaged products should be analysed as following:

- Vacuum and headspace
- Tin, iron and lead contents
- Container corrosion level
- General appearance of packaged product
- Flavor

Samples must be analysed periodically at 0,1,3,6,12 and 24 months of at 23° C and 35-37° C.

A N N E X III

III.1 Seminar Program: 'Tinplate containers for food industry

Objective:

To convey knowledge on the manufacture of metal containers and give some considerations for their selection. Determination of food shelf-life. Recent developments in other countries concerning food products and containers.

For:

Food Technicians, Biochemical Engineers, Quality Control Managers

Dates:

August 21 to 23, 1982

Schedule:

From 8:30 to 17:00 hours

Place:

Centro de Investigación y Asistencia Técnica del Estado de Querétaro.
Av. Del Establo 150
Col. Fovissste 76150
Querétaro, Qro.
Mexico City

Subscription

$10,000.00 mexican pesos

Lecturers

Dr. Ramón Catalá
Quim. Daniel Landeros
Eng. Leonel Tamayo
Eng. Luis Fernando Carbajal
Q.F.B. Julieta Sánchez

Program:

Wednesday 21

8:30 - 9:00	Subscription
9:00 - 9:30	Inauguration
9:30 - 11:00	Tinplate for containers manufacturing in Mexico Eng. Leonel Tamayo
11:00 - 11:20	Break
11:20 - 13:00	Requirements and specifications of metal containers for food products Q.F.B. Julieta Sánchez
13:00 - 15:00	Break
15:00 - 17:00	Fundamentals and practical aspects of interal corrosion of metal containers for foods Dr. Ramón Catalá

Thursday 22

8:30 - 9:30	Lacquered protection to the tinplate Common lacquers for food containers Quim. Daniel Landeros
9:30 - 11:00	Two pieces containers Eng. Luis Fernando Carbajal

11:00 - 11:20	Break
11:20 - 13:00	Determination of shelf-life of canned food Dr. Ramón Catalá
13:00 - 15:00	Break
15:00 - 17:00	Industrial technical visit to a food processor company

Friday 23

8:30 - 11:00	Main quality control tests for metal containers for food Quim. Daniel Landeros
11:00 - 11:20	Break
11:20 - 13:00	Metal Containers for food in the International Market Dr. Ramón Catalá
13:00 - 15:00	Break
15:00 - 15:45	Picture: "The Miracle of Cans"
15:45 - 17:00	Round Table Clausure

III.2 Lecture "Metal Containers for food in the International Markets".