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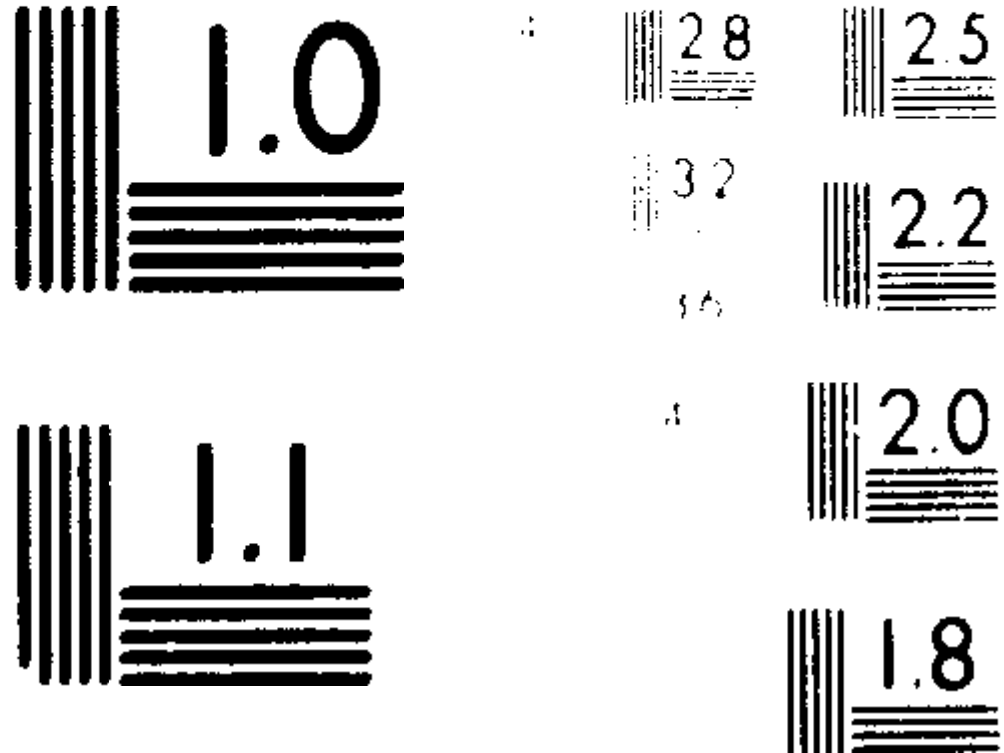
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DP/ID/SER.A/341
2 March 1982
English

CONSOLIDATION OF THE MEXICAN INSTITUTE FOR ASSISTANCE TO THE INDUSTRY

DP/MEX/78/011

MEXICO

Technical report: Production of metal packages *)

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 D. Reznik, Consultant in the Production of Metal Packages

United Nations Industrial Development Organization
Vienna

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V.82-22776

C O N T E N T S

A N N E X E S

ABSTRACT

The project of "training a team to assist and consult the can makers" and all industries involved in canned food under DP/MEX/78/011/11-09/B/31.7.E commenced on January 16th.

The purpose was to train 12 engineers from IMAI - LANFI, a governmental institute for technical assistance to the industries involved in canned food.

Such a team may be needed in many countries especially in those where the can making and tinplate manufacturing industries do not have sophisticated research institutes.

The objective was to study the needs of Mexican food industry in respect to quality of cans, the research activity of the can making industry, its quality control, and its potential to fulfil the needs in quality. Similarly, to study the capabilities of the raw materials industry, the tinplate and the organic coatings manufacturers, their quality level and control, as well as the services they render to the can makers.

In view of the above a team of food engineers, already working at LANFI - IMAI, has been trained to fill gaps in testing techniques and know how solving problems in the industries involved especially the food industry and the consumers of canned foods.

During the two months mission the situation was studied and analysed. A course on tinplate and can manufacturing, including quality factors and its testing and evaluation, was given to the team with an emphasize on the inter-relations between the different components and factors affecting quality.

The team members had almost no industrial experience. Also, it's scientific and technical basis needs improvement. However, the team had been instructed on the establishment of testing procedures, some of the equipment needed had been installed, some research and study program was planned and the goal was clarified. In six months the situation will be reviewed and the team will be further trained accordingly. The team is not ready yet to assist much the industry, but equipped with some test methods and equipment the industry does not have it can begin some cooperation with the can making and the food industry.

INTRODUCTION

The objective of this mission was to train a team of engineers from LANFI towards the goal of establishing entity that will assist the industries involved with canned foods.

The can, and all industrial products involved will still be on the market for many years to come. Inspite of the development of new materials, technologies and techniques, the can will contirue to be the major pack for many food products.
Hopefully some other good packaging materials and techniques will be developed in parallel to further improvement of the cans.

Corrosion problems of cans were decreased by improvement of tinplate quality and by further developing the lacquered can. However, while in case of plain cans improvement, further revolutionary developments are unlikely, the industries involved in lacquered cans have not reached this situation.

A breakthrough is or should be expected in quality of tinplate and similar metal surfaces that will yield a better lacquered plate for can making. Development of better coatings and application techniques will improve cans performance. Further understanding of the interaction between cans and food products contained will help optimizing cans quality and cost.

Mexico is generally in the same position like many can making countries in the world, but it can take its share in the contribution of know-how development.

Quality of cans depend on the raw materials and machinery used. Assuming that Mexico will not enter into innovation and production of new can making machines, it should concentrate in the field of improving the raw materials and the techniques involved in this field.

A significant advance in this field can be reached only by the cooperation of all industries involved. Moreover, only by incorporating all disciplines involved, a better can may be developed.

Therefore, a team consisting of knowledgable people in tinplate, lacquer, can making and canning industries, looking and studying the problems and solutions, from all its aspects. may be very promising.

By this approach and understanding, a group of scientists and engineers was selected to be trained. The training, equal to all participants, included a basic course in tinplate manufacturing, can making and the interaction of the different components of the food can.

The idea of interrelationship of the different factors influencing quality was stressed all along the course.

The approach based on the analysis of problems, being free of misconcepts and prejudices was overstressed.

The course included lectures to gain understanding in raw materials, review of all tests to evaluate quality of materials and some new tests based on the mechanisms involved in lacquered cans performance.

The team was inexperienced in the industries involved, this is of course a disadvantage, but the fact that they were not spoiled by misconcepts may serve as a good starting point.

All team members will perform all the tests mentioned. By doing so, equipment will be purchased or designed and ordered, materials will be ordered and stocks will be guarantied. The test procedures will be established and improved.

By this procedure, each of the members of the team will choose his major field of interest. The next step will be studying cases of failure in the industry. On these studies, the way to analyse the problem will be practiced, tests to verify assumptions will be suggested, discussed and performed.

In the future, case histories will be studied and analysed, problems from the industry will be brought for practicing the approach for analysing and solving an industrial problem.

The subject of cooperation with the industry had been considered. In our talks and visits to the industries, and in the frame of a seminar we were trying to demonstrate the potential of this team and the institute, to assist the industry. We hope also to find the way that the team members will work for some weeks in each of the industries involved.

In order to make this acceptance in the industries more attractive, it is suggested to plan short term investigation projects, that will include specific test methods and equipment that the industry does not have. By this, the industry will appreciate the cooperation and hopefully will ask for it in the future.

By the development of the know how and experience in this field, the team will be in a better position to participate in forming standards and implement them.

1. JOB DESCRIPTION AND FULFILMENT

The job description objectives were to analyze the situation of the canned food industry in respect of quality and shelf life with the intentions to improvement.

Some visits were paid to the tinplate, can making and food manufacturing plants. Besides, canned products were bought on the market, its content and the packages were tested and analysed. From these two activities it was possible to point out what are the problems, its source and the potential of the industries involved to solve them.

In result of this activity, and in view of the goal to establish a comprehensive canned food unit, a policy could be determined.

It has been clarified that the target cannot be reached in the frame of the two months mission. Unfortunately, even the stage from which the team members could continue without the expert's assistance has not satisfactorily reached.

Three engineers, destined to deal with tinplate, did their best to prepare themselves for self study, the rest, dealing with the other disciplines did not concentrate on reaching this stage. In result the group is not yet ready to work as a team, neither they had the opportunity to practice it even once.

It seems that with a continuous instruction and training, and maybe, by recruiting some experienced engineers from the industry it will be possible to reach the goal, and establish an entity that will be able to study problems from multiple disciplinary outlook and a wide angle, approach that the specific industries cannot use.

The team is not ready yet to utilize the results of this initial training. Before such utilization takes place, the team must require: experience in testing, wider and deeper outlook, a relative advantage on the specific industries and confidence in their mastering the field, ability to assist and even confront the industry.

Only after mastering the testing techniques, understanding the meaning of the results, being able to analyze failures objectively, prove and verify their judgement by offering reliable tests - only then utilization may start. Until then, the activity should be based on cooperation with the industry and forming respectful working relations.

To achieve all that, a group leader has to be selected to keep the group active in the right direction.

Having had more time, one or two months more, the team could reach the stage of self study in the frame of a new fresh analytical approach. However, inspite of the planned continuation of the expert's mission in six months more, measures should be taken at least to keep whatever has been purchased, keep the inertia and follow up the team members work and performance.

2. THE NEW APPROACH

There are quite a number of misconcepts common in the can making industry. Due to these the industry is still facing failures with lacquered cans, especially with tomato cans.

Some of these misconcepts were studied at LANFI. By this we meant to achieve two things:

A fresh approach to study problems.

1. Do not accept every procedure the industry is using as the optimal. Study it by the new know-how and test methods. This should be part of the studies program in the future.

2. Gain of relative advantage on the industry, thus being able to contribute in solving problems and improving can quality and performance.

These in turn will increase the confidence and enthusiasm of the team and will serve as good advertisement to the services it can give in the future.

Some of the examples studied and will be further elaborated in the laboratories during the next year were:

1. Influence of tinplate quality
2. Influence of lacquer type and quality
3. Influence of coating weight of tinplate under the varnish
4. Influence of varnish coating weight
5. Influence of baking time and temperature with different varnishes
6. Influence of above factors on sulphur staining
7. Influence of mechanical damages in dependance of the above factors
8. Quality of side stripes, its advantages and disadvantages.
9. Contribution of types of food products on lacquered can performance.

All these studies will be performed using conventional and non conventional tests.

The final stage will be to correlate these results with test packs.

Test pack tests should be made with cans manufactured from same raw materials with controled changes. By this the unknown factors will remain constant.

For this purpose a good will and cooperation with the industry will be needed.

Cans cannot be manufactured at LANFI, and making cans of controled variation in the can making plant will demand considerable attention, manpower and it will slow the lines operation.

These cans if produced should be filled at the same time in a canning plant. However, these experiment should be planned, offered and performed only after thourough study at LANFI on a laboratory scale.

It may be assumed that a report showing a clear picture of potential contribution to the industry will help achieving the assistance and cooperation of the industry. When this time arrives, the team will be able to show, that by using its know - how, the can maker can save materials and claims and the food industry will receive better cans.

3. PROGRAMING AND TRAINING

In order to prepare the course program, some visits to the industry were made. The main object was to find out what are the problems of the mexican industries, what should they do to improve the situation and where could the LANFI team integrate and contribute to improve quality.

Another mean to determine the course program was the seminar given on the 25 - 27 of February. According to the questions raised and trhrough talks with representatives of the different industries, we could get a better picture of the situation. In the seminar some talks were given by the can making industry and from these one can also learn about the approach to the whole field.

The following will describe the major conclusion from the visits in respect to the project in LANFI.

3.1. Tinplate Industry - AHMSA

The mill is owned by the Government and tinplate is price controlled. Quality of the final product is poor because of lack of good equipment, maladjustment of the existing machines and poor quality control. The tinning lines are very slow therefore uneconomical. A group of quality control people for the tinning line is not knowledgable enough and has almost no influence on quality. The management is not interested in producing the heavy gauge tinplates and is producing maximum E-2 material, as a matter of fact they are not interested in producing tinplate at all.

As all tinplate is of low tin coating, most of it should be lacquered. Attention should at least paid to improve surface qualities.

However, in view of the policy there is doubt if LANFI can achieve any cooperation.

3.2. Can Making Industry

Generally speaking the major can manufacturers are using good equipment and manufacturing procedures, therefore cans quality

is quite satisfactory. However, like in many similar industries in the world, there is too much reliance on the raw materials manufacturers. There is not enough involvement in the needs of the food industry. Not enough is being done to produce better optimal cans for the food industry, especially for specific mexican products.

The source of know how is mainly from the U.S.A. especially in the companies affiliated with U.S. can makers. While the procedures of can making dictated are sufficient, there is not enough consideration of the specific needs and the recommendations of cans to products are not always adequate. No plant has a food technology department to solve the problems and fulfill the needs of the industry even if this does not demand it.

Quality of cans is not guarantied. Cans do not leave the manufacturer plant with confidence that they will perform well. The tests to ensure good performance are not known or done, if these tests were not recommended by the mother companies. Therefore quality of tinplate for plain cans may be ordered but not controled. As the local manufacturers do not develop their own know-how it is clear that they suffer from the lack of know-how of the mother companies.

There is not really an address to turn to in case of failures. There is no knowledgable experienced institute in Mexico to assist can makers and it is doubtful if even American daughter companies can be assisted. There is not enough pressure from the food industry neither from the consumer on the can making industry to improve quality and supply the most suitable can.

Furthermore, it seems that there is no competition between the can manufacturers and one of the reasons for it is the lack of cans on the market. Many of the food manufacturers were complaining about difficulties in supplies. In such cases the food industry may have to use whatever is available or unsuitable can.

3. Food Industry

Quality control of cans in the food industry begins and ends only in case of some trouble or failure. They rely on very vague empirical experience. Absolutely not enough is being done to use the optimal can suitable for the product.

There are no implemented standards for ordering and accepting cans. The food industry does not dictate the quality and suitability of cans and it could be said that they are lucky that the level of can quality is relatively satisfactory.

It can be assumed that with better understanding in can quality, or better assistance in this subject, the food industry could demand and receive better cans. The potential of the can makers is high enough to better satisfy the needs.

Because of lack of know-how and control the food industry is paying in some cases more than it should. Advancing the level of know-how could mean savings in costs of cans and prevention of failures.

There are problems that the food industry does not even realise. For example, corn and maybe other products packed in cans coated in C-enamel have some bitter taste. This off flavor comes from diffusion of some constituents from the oleoresinous based lacquer. Not much attention is being given to the subject, and those who observed the phenomena, attributed it to the variety of the corn.

Some canners are using unlacquered cans for chili, the cans are severely sulphur stained, but it seems that this does not disturb the consumer nor the industries involved.

All tomato puree cans showed severe underfilm corrosion and lacquer peeling after one year of storage. Many of these cans were also hydrogen swelled; this pehnomena is especially severe in the beaded 3 Kg. cans. Some can makers admitted awareness to this problem offering two lacquer layers in such case. This is not going to solve the problem. This is one example where american know-how is insufficient, but the problem is much more severe in Mexico because of the differences in shelf life length and may be storage conditions. Also, though the local manufacturers use same manufacturing conditions, as in the mother U.S. companies, they do not follow strictly the quality control procedures.

3.4. Varnish Industry

Similarly to the can manufacturing also varnishes are produced in Mexico based on American know-how. This industry, in Mexico

like in many other countries, is not involved enough in the whole field. There is no significant research and development and manufacturing is not based on understanding the inter relations between tinplate and their lacquers, as well as the food with the lacquered can.

4. CONCLUSIONS

The three raw materials for the food industry are: the tinplate, the lacquer and the can.

The lacquer and the can industry has a higher potential than that exhibited in the market.

If there was and knowledgable experienced entity that could advise these industries on one hand, form and implement standards on the other, then the potential of all industries involved would have been realized.

LANFI can contribute to this improvement by putting in front of them the goal to serve as a center which deals with all aspects and disciplines involved in canned products.

For this LANFI should establish a team that will include food engineers specialized in metalurgy of tinplate, food technology, polymer science and physical chemistry.

It would have been beneficial if some of the team members had industrial experience, or at least let these acquire some by working a few months in the industries involved.

LANFI will have to show that not only they know to perform some of the tests involved, but also know the problems of each industry involved. LANFI must have a relative advantage on each of the industries. While they cannot know more than the canning industry about food processing they may know more about tinplate, cans and corrosion. They may know more about varnishes than the food and may be also the can making industry. They may know more about varnishing tinplate and its performance than the manufacturers of both raw materials.

The course given to a group of 12 engineers at LANFI was principally based on this approach. However, this group is still far from

being able to offer the above services to the industry. The major reasons for it is the lack of industrial experience, but also lack of experience in testing materials, analysing problems and applying basic science knowledge to explain phenomenas.

The team has to gather experience in testing tinplate varnishes, varnished plates, food products, cans and some inter relations between the different components.

It should test products from the market, preferably after long storage, between one and two years. A training program that will include problems and tests should be prepared for the team under strict supervision with the goal to achieve the level of relative advantage on the industry. This program should include analysis of failures. Possible solutions and explanations to failures should be suggested and the assumptions should be verified by tests.

The first step to establish a new and unique entity in LANFI has been made. It seems that it is possible to reach the goal and it is worthwhile to do it. There is a necessity for such a group in Mexico and if efforts, patience and hard working will be invested, as well as original thought in sticking to the goal, a fruitful entity could be established.

5. RECOMMENDATIONS

A study and self training program for the team should be established. A group leader should be chosen to follow the program.

Short term projects should be planned and each of the team member will get some responsibility. Every week or two each will report in a frame of a seminar of his advance.

Contacts with the industry should be established in order to receive raw materials and samples for the studies, and also cases of failures for analysis.

After controling some of the tests, especially those that the industry cannot perform, such services will be offered to the industry, preferably without payment at these initial stages.

Thought should be given to the possibility to add people with industrial experience to the team.

During all operations, technical or administrative, the goal should be kept in mind - establishing a reliable objective entity to serve the Mexican industries involved in canning.

By no means should the team at this stage be involved in dispute between industries. Mistakes in public relations, advertisement start before time, etc. may stain the institute and the idea for a long time in the future.

The group should widen its horizons in the disciplines involved in canning. One of the ways to achieve it is by seminar given by the team member, to which people from the industry may be invited. Such audience may give an additional dimension to the meetings and will contribute to the level and fruitfulness of the seminars.

TINPLATE TESTING

ANNEX I

Tests on tinplate should be made on the plain and lacquer coated tinplate.

Most tests should be performed on the tinplate upon its arrival to the can making plant, so that the lots of tinplate at store are classified.

Tests on plain tinplate:

1. Sheets dimensions
   Length, width, thickness and squareness
2. Tin coating weight
3. Porosity of tin (exposed iron)
4. Oil layer distribution
5. Grain size
6. Passivation and oxides layer (sulphur staining resistance)
7. Lacquerability
8. A.T.C. , I.S.V.
9. Hardness
10. Drawability and mechanical properties
11. Appearance, camber, waves
12. Solderability

Tests on varnished tinplate:

1. Varnish coating weight
2. Porosity

3. Mechanical adhesion (scratch and scotch test)

4. Scratch resistance

5. Bend resistance

6. Drawability

7. Degree of polymerisation

8. Sulphur staining resistance

9. Sensitivity to blistering peeling and underfilms corrosion from exposed metal.

10. Sterilization tests with water, acids and products (for off flavor, lacquer adhesion and blushing)

These tests are performed with one known lacquer to evaluate general quality of tinplate for lacquering, and with the specific lacquers to ensure the tinplate is adequate to the specific end use.

ANNEX II

TIN MILL PRODUCTS MANUFACTURE

The manufacture of blackplate, tinplate and tin free steel starts with a coil of steel of about 2 mm thickness.

Some of the properties of the end product depend on the composition of this raw material.

There are three major types of steel used for can making L, MR, MC. These types differ by trace elements in the steel, which determine the corrosion resistance and mechanical properties of the steel

The choice of type of steel, by the can maker is based on the type of can to be manufactured and the food product to be contained in it.

For corrosive products, especially in plain cans, type L should be prefered. Type MR is most commonly used and type MC is used for lacquered cans for non corrosive products.

The manufacture of the above products involves the following operations:

1. Cold reduction (to ordered gauge)
2. Degreasing
3. Annealing (650-700° C)
4. Temper rolling
5. Preparation
6. Plating
7. Marking (differential tinplate coating)
8. Flow brightening
9. Passivation
10. Oiling
11. Testing
12. Shearing or coiling
13. Packing

For black plate the temper rolled steel is cleaned and oiled before packing.

For T. F. S. the coil is plated with chromium (metalic and oxides) instead of tin, then oiled tested and packed like in tinplate fabrication.

Blackplate has not found yet uses for food cans. It demands relatively high coating weights and may be used for general line purposes.

The use of T. F. S. instead of tinplate is increasing, especially for ends in food cans and general line purposes. T. F. S. is always lacquered and cannot be soldered to form a can body, neither can it be deep drawn.

However, lately with improved technologies it can be welded to form a three piece can.

The suitability of lacquered T. F. S. to food products is more limited than tinplate. It cannot be safely used for products containing acetic acid and quite offen may lead to hydrogen swells without significant signs of corrosion in the can.

Tinplate may be excellent material for lacquered cans although some lacquer peeling problems have occured in the past and may still happen in the future because of lack of know-how in this field.

PERFORMANCE OF LACQUERED CANS ANNEX III

The lacquered can, if optimally produced, is an excellent package. It can be looked upon as a very thin plastic bag reinforced by steel. The lacquer is a plastic barrier about 5 microns thick, well balanced and baked. One should expect corrosion of plain tin cans increasing the metalic ions content of the product. On the other hand plastic containers have limitations in respect of strength, heat and light resistance, and diffusion of some organic constituts into the product.

The main advantage of the lacquered can is the potentially excellent thin plastic layer with the strenght of a steel can, hence, incorporating the advantages of both materials.

If all factors like the long shelf life, wide use, ease of handling and speeds of operation, the safety, the long experience gathered and well established machinery and technology, are taken into consideration, one may find the lacquered can as also optimally economical.

However, many quality and control problems are encountered in the manufacturing of lacquered cans, and not all of these problems have reached a satisfactory solution.

The quality and performance of the lacquered can depends on multiple factors and it is erroneous to consider only the quality of the lacquer, although it may superficially seem so in case of failure.

1. One of the major factors is the quality of the tinplate's surface. Some constituents on the surface, like some salt residues or inadequate oiling, are known to result in poor coating performance.

While these can be eliminated, the positive factors, which will improve adhesion and performance, are not well known. For example, defined and suitable tinplate surface is not available on the international market, standards on this aspects hardly exist and therefore, quality is not guarantied.

The different passivation processes yield materials with different tendencies for generally different uses, however there are great differences in performance of each passivation treatment, not only between manufacturers but also between different batches of the same manufacturers and even between the two faces of the tinplate. This is not only due to the differences in the composition of the passivation layer but mainly due to other uncontrolled factors.

2. The lacquers used commercially are usually well controlled, and although one may find variations between batches, these are usually not critical. However, they are only generally adjusted to tinplate.

3. The food product and its composition is a very important factor. A can that performs well with one product may fail with another.

Therefore in order to optimize the can, the product to be filled should be considered, and the raw materials have to be carefully examined and selected.

4. Another factor is the manufacturing precedures at the can making plant, which include the lacquer application, baking, handling of the lacquered sheets and the can manufacturing.

a) The coating weight should be considered as well as baking time and temperature. The rule of "the more the better" -does not necessarily apply here. Manufacturer's recommendations are very general, and there is more than one set of conditions for optimal application.

Heavy coatings may tend more to peel with some food products, as well as the highly baked coatings. Light and underbaked coatings will yield porous surfaces.

b) Lot of consideration should be given to prevent scratches during handling and can manufacturing. It is very important to prevent or eliminate any unnecessary shear forces, as these tend to reduce drastically the lacquered plate quality. This can be done by optimal adjustment of the machinery.

c) At the canning plant care should be taken to prevent mechanical damages especially at the sealing station. Special attention

should be given to eliminate scratches of the ends, inside and outside, at the feeding station, and special measures should be considered at the embossing station.

5. Except for a few products, like for example citrus juice, the lacquered can is suitable for most food products. It provides a relatively long shelf life, and in many cases the can is not the limiting factor of shelf life.

The major dangers one should consider are: hydrogen swell, lacquer peeling and underfilm corrosion, tin and iron pick up, sulphur staining, off flavors and off colors.

In many cases the lacquer peeling and corrosion phenomena are located at some sensitive parts of the can, like side seams, embossing of the end, the strenghtening beads and, of course, pores and scratches.

To prevent the above phenomena the quality of the tinplate, the lacquer and manufacturing procedures, machinery and it's condition should be well studied, examined and controlled.

Hydrogen swell may result from unsuitable lacquer, too thin and or insufficiently baked porous lacquer. Mechanical damages, seen and unseen, reduce the lacquer resistance to diffusion, and also lead to hydrogen swell.

Lacquer peeling may occur with or without significant corrosion. This phenomenon is very much controlled by tinplate quality. Of course the quality of the lacquer, the nature of the product (it's composition) and storage conditions are important factors.

Underfilm corrosion, followed by detachment of the lacquer, starts usually at scratches. This phenomenon is controlled mainly by the tinplate quality, but also by the type of lacquer and its application conditions. This phenomenon may not occur at all in some products. Tomato products tend to cause both, hydrogen swell and lacquer peeling, and it is not because of its acidity. Some more acid products like citrus concentrates will cause hydrogen swells through pitting corrosion (that might lead to perforations). Acetic acid products may cause hydrogen swell without easily observed damage to the lacquer. This phenomenon is very common in lacquered T.F.S. cans.

Depending on the type of lacquer used, its application conditions (baking) and the food product contained, some off flavors may develop. This problem may be relatively easily resolved.

Sulphur staining may be formed due to poor passivation treatment of the tinplate, scratches on the tinplate (before lacquering), too thin lacquer layer and low time and temperature baking. This phenomenon might be quite easily eliminated by the use of special lacquers like C-enamels. However with adequate passivation and by proper lacquer application the phenomenon is completely eliminated.

Black spots of iron sulphide may appear at metal exposed points on the internal side of the can, especially along the side seam.

It is the task and responsibility of the can maker to provide the optimal suitable can. However, while some of the factors may be controlled at the can manufacturing plant, others are (or should be) controlled by the manufacturers of the raw materials and can making machinery.

The major mechanism in lacquer performance is by diffusion of some elements through the film. This mechanism controls lacquer peeling, blistering, staining etc. These phenomena are controlled, therefore, by the specific properties of the film, like it's resistance to diffusion of some elements, and the type of bonds between the metalic surface and the coating.

Time and temperature of storage will influence the rate of deterioration, but this depends mainly on some elements in the contained products, quality of tinplate surface, type of lacquer and its application conditions.

Low quality or unsuitable tinplate may be compensated by the skilled can manufacturer by adjusting coatings and procedures. For example, poor sulphur resistance (poor passivation) of tinplate may be compensated by heavier coatings and higher baking temperatures. Lacquer peeling may be controlled by choice of suitable tinplate or use of two

different selected coating layers. However, these operations are usually costly and demand know how, experience and special attention.

In conclusion, more reliable test based on better understanding of the mechanisms leading to failures should be established. Also, as mentioned above, the factors influencing quality and performance are combined, entangled and depend on each other. Therefore, the only promising approach to improve lacquered cans quality is to study the subject, incorporating all disciplines involved. In other words, the study has to be performed by experts in all the disciplines and industries involved, with a common effort and goal and in a coordinated frame.

Optimal coatings can not be developed without considering tinplate surface, food composition and the specific machinery involved. A group enjoying the feedback of all sectors has the best chance to develop and optimize all his operation.

ANNEX IV

DRAFT OF AN INTERVIEW FOR PUBLICATION

IN ULADE BULLETIN

The can is a good package which provides a long shelf life and has many advantages on many other materials and packages. This is the reason for its long existence in the market and for this, it will stay for many years more. Other materials are being used for food packing and each may take its share in the market depending on its properties, limitations, advantages and disadvantages.

In principle the package should not limit the shelf life of the product. Food products degrade biochemically, plain tin can may corrode and lacquer from varnished can may peel off and corrosion may take place.

Storage at low temperature will decrease biochemical degradation. Using high tin coatings of high quality tinplate for products like citrus juices in plain cans will decrease corrosion. In lacquered cans, to prevent corrosion or lacquer peeling, the can maker has to control surface quality of tinplate, varnish quality, application conditions of the varnish and mechanical damages to the varnished plate during can production. Also the type and quality of the food product has to be considered.

The production of a reliable lacquered can is complicated and involves a number of disciplines. Hence, in order to produce the can which will insure long shelf life, the subject should be approached from all disciplines involved.

In Mexico like in many other countries each of the industries is involved in its own field. However, to deal with all disciplines involved may be beyond the means and capacity of the individual industries.

One of the solutions to the Mexican industry is to establish a team at IMAI - The Mexican Institute for Assistance to the Industry, that will deal with all subjects of quality of canned food.

The team will specialize in the inter relations between the different raw materials and products. By that, it is hoped, the gaps in know how between the different industries or disciplines will be better covered.

In reply to questions, Mr. Reznik has commented that the can and the varnish making industry in Mexico is on a satisfactory level and

with a good potential to satisfy the needs of the local food industry, which suffers from shortage of supplies of cans, and in some cases of inadequate quality. Improvement of can quality for tomato products, for example, is necessary.

During the next year the team will gather know how and experience in tests and analysis of failures. We all hope that in the near future it will contribute to improve quality and techniques in industries involved in canned foods.

General Background - David Reznik

He was borned in Tel Aviv, Israel, graduated in Chemical Engineering. Later, he obtained a high degree in Food Engineering. He has had long experience in both fields working for Metal Box in U.S.A., under Agricultural Engineering in a Packaging Plant at Israel, and in NAFINSA in Mexico City, as Assessor in the project of establishing equipment for processing food.

Since 1973 he is working in his own Investigating and Consulting Company in Food Industry, process development and machinery.