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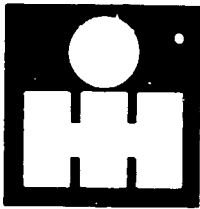
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PARA TRATAMIENTOS TERMICOS
CALENTAMIENTO, ETC

SECCION METALGRAFICA

HORNOS DE SECADO
ALIMENTADORES DE MOJAS
MAQUINAS DE BARNIZAR, ETC

UNITED NATIONS INDUSTRIAL DEV. ORG.
Vienna International Centre
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===== AUSTRIA

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su referencia

su objeto de

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referencia

BILBAO (SPAIN)

AE/MIN

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Project nº DP/VIE/88/036
Activity code : J13320

SUPPLY OF MACHINERY, EQUIPMENT, SPARE PARTS AND
MATERIALS AND THE PROVISION OF SERVICES
for the
ESTABLISHMENT OF A DEMONSTRATION TIN PLATE
COATING PLANT AND LABORATORY FACILITIES
in
THE SOCIALIST REPUBLIC OF VIETNAM

=====

FINAL REPORT

UNIDO contract No. 89/143
Project No. DP/VIE/88/036
Activity code: J13320

CONTRACT
between
THE UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
and
Ingeniería y Hornos INGHOR, S.A.

for the
SUPPLY OF MACHINERY, EQUIPMENT, SPARE PARTS AND MATERIALS AND THE
PROVISION OF SERVICES

for the
ESTABLISHMENT OF A DEMONSTRATION TIN PLATE
COATING PLANT AND LABORATORY FACILITIES

in
THE SOCIALIST REPUBLIC OF VIETNAM

Final report: Activities carried out from 20 November, 1989 to 8 December, 1990¹.
Prepared for the Government of the Socialist Republic of Vietnam by the United Nations Industrial Development Organization, acting as executing agency for the United Nations Development Programme.

Author of the report: Aniceto Eizaguirre Basterrechea, Director of INGHOR.

Backstopping Officer: J. Belo, Engineering Industries Branch.

United Nations Industrial Development Organization
Vienna

**DEMONSTRATION PLANT FOR A TINPLATE COATING LINE IN VIETNAM
ABSTRACT**

The present report will try to summarize the whole project carried out in Vietnam, i.e. the installation of a demonstration plant for tinplate coating and its posterior application in the manufacture of metal cans for the food canning industry.

The project was clearly made up of two different parts. One of them was the installation of the demonstration line,- at industrial scale-, and the other one was to train the human team so that they would be able to develop this coating technique successfully.

This actual report will be developed taking these two perspectives into consideration.

Date of the report: January, 1991
Name of the author: Aniceto Eizaguirre Basterrechea
Contract reference: DP/VIE/88/ 036/ CONTRACT 89/143/MK

**INGENIERIA Y HORNOS
TERRAZAS R. S. A.
P. R.**

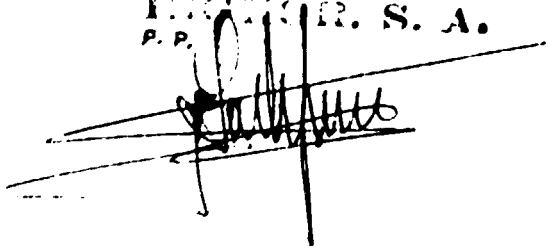
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FOREWORD

We will start dealing with the different works performed in chronological order, so as to make it easier for the reader to understand the whole process.

Each step of the installation will be dealt with from the two points of view we have already mentioned, that is, the installation of the equipment itself and the training of the human team.

We will explain in detail the work carried out in each step and we will also evaluate the degree of training achieved.

At the end we will make a final evaluation.

We will proceed with the information giving it in a chronological order, and for that purpose we will define the following stages:

- 1.- Getting in contact with the situation of the tinsplate coating industry in Vietnam.
Study of the material and human resources to back our project up. Starting from this information, a report was written to help create the necessary substructure for the installation of the coating line and the quality control laboratory.
- 2.- Training of the personnel that will be in charge of the plant. This was part of the process was carried out in Spain, and it was finished at the same time as the end of the construction of the equipment.
- 3.- Unloading and assembling of the equipment in the plant of Ho Chi Minh City. This circumstance was also used to deepen the knowledge of the equipment.
- 4.- Starting on of the equipment and training on the handling and control of the quality of the coating.

CONTRACT CONJUNCTURE

This is the final report of the contract, and it will try to inform the reader about the achievements of the same, explaining and giving reasons of the chronological development of the whole process.

First of all we must know which has been the goal. The goal has been to give Vietnam, through VEGETEXCO, material and human possibilities to develop the technique of protecting metal cans to be used in the Food Industry of this country.

Regarding the material needs, we may say that a demonstration plant, at industrial level, was needed, as well as a quality control laboratory for the reception of varnishes and for the application of these.

The general supply foreseen for this project was made up of a complete modern coating line with an average production of 4.000 s.p.h. and a set of elements for the laboratory, which is normally used in the European factories.

This supply itself had become a problem as the people who were supposed to be in charge of it and to man it did not know the equipment. Therefore the training of the human team was oriented first of all, to get to know how to use the demonstration line.

In our opinion it was also very important not only the knowledge of the handling of the machine but a deeper knowledge of the same and its different parts in order for the technicians of VEGETEXCO to carry out a correct maintenance and in order for them to be able to answer to any problem that may arise with the different parts of the equipment in the future. This is what we may say about the material elements, their use and maintenance.

The other aspect was to prepare the human team on the different factors involved in this technique: tinfoil, varnish, application technique and quality control for different food products.

All these points were born in mind when carrying out a complete training of the human team of VEGETEXCO. The reader may have noticed that a very important part of this project, maybe the most important one, was to have a team of technicians with high technical qualifications, capable of assimilating, in a relatively short period of time, all this information.

It was also very important to build a substructure around the demonstration plant. This was another one of the keys to the success of the project.

The meetings we had with VEGETEXCO made us aware from the very beginning that they were very conscious about this matter, and that they were willing to create this substructure according to our experience and to our knowledge.

About the aspect regarding the human team we understood that, given the interest shown for the project, this aspect would be treated with the same importance as the already mentioned matters. Time has shown we were right in this assumption. In the very first meetings we had with the technicians we were overwhelmed by their interest and qualifications. Now, after having finished the project, we have understood that this point has also been crucial for its success.

PROGRAMME OF WORKS AND TIME SCHEDULE

In the previous section we have explained the content of our ambitious project programme, listing each one of the aspects that had to be born in mind in order to achieve an acceptable result.

Now what we will do is to explain, in chronological order, the measures we adopted to carry the project out:

1st The first measure to be adopted after having known the situation directly, after our visit to Vietnam, was to give VEGETEXCO a series of drawings, technical data and suggestions that would help them create the substructure that was necessary for the correct installation of the equipment.

Today, one year later, we can confirm that this information was taken into consideration and all instructions were carried out with so much interest that one can find no disadvantages in this line when comparing it to the most modern installations in the world.

In this regard, we may say that the attitude of the people of VEGETEXCO has been exemplary.

2nd Secondly, the final stage of the manufacturing of the equipment was also used as a training of the team of technicians from VEGETEXCO.

Basically, this training consisted on:

- a) Theoretical lectures on the equipment, with drawings, carried out in the Technical Office of INGHOR, S.A.
- b) Practical teaching on the different elements of the equipment, participation in their quality control processes, starting on of partial elements of the installation.

- c) Time was spent in three different factories of lithography or coating, participating in the work being done in them.

This is all that was scheduled and done about the knowledge of equipment. The team of technicians also visited the company ALTOS HORNOS THE VIZCAYA, Spanish tinplate manufacturer, where they could see how the material was manufactured, and where they received oral and written information on the same material, basically following the point of view of its use in the food industry, i.e. metal cans.

The team of technicians also spent various days in the company PRISMA, S.A., varnish manufacturers, where they saw production installations and varnish quality control premises.

They studied the different types of varnish and its use for the different food products. They also received very interesting written information.

Finally the team visited the company NEURTEK, manufacturer of laboratory elements where they had the opportunity of practising and getting information on the technic of quality control, and this way they were capable of comparing the systems of each one of the companies.

- 3rd In the third place and during the assembling of the line, the knowledge on each element making up the equipment was completed. Although our technician was working full time giving explanations on the importance of various assembling points and directing the order of the assembling process, the human team and the preparation given to this team made it possible to have the process completed in a record time.

- 4th Afterwards, the starting on of the equipment was also completed without the direct participation of the

technicians of INGHOR. What the technician did was give explanations on the implications of the adjustment of different parameters and equipment on the installation, possible problems that may arise, maintenance, etc,...

Regarding the laboratory works and the quality control, we were not of much help to the VEGETEXCO team, as it was noticed that they had already acquired a deeper knowledge than ours.

CARRY OUT OF THE CONTRACT ACTIVITIES

In this section we will give quite a lot of information on each one of the four steps defined in the table of contents. As each one of these stages was summarized in a report, we will come back to those reports.

FIRST REPORT, dated on 13.12.89

Including site study, plan layout and specifications for auxiliary functions. (ANNEX 1)

SECOND REPORT, dated on 18.06.90

Training process carried out in Spain by a team of technicians from VEGETEXCO. (ANNEX 2)

THIRD REPORT, dated on 20.11.90

Assembling of the installation for coating and drying tinfoil sheets. (ANNEX 3)

FOURTH RECORD, dated on 2.01.91

Starting on, final test and laboratory tests of the installation for coating and drying tinfoil. (ANNEX 4)

The reader will notice in these partial reports that the author is quite pleased with the result achieved in the section regarding the training of the team of technicians from VEGETEXCO. It is not strange for the author to give special importance to this aspect of the project, as the success of the project - in the opinion of the author, who knows very well the supplied installation - depends in a great measure on the degree of technical preparation of the user.

We might also say that generally speaking, and except in the case of big multi-national companies, the lithography companies

usually do not have a highly skilled technical teams. What the team usually does is merely to use the machinery and rely on the service offered by the manufacturer or by auxiliary workshops located nearby for maintenance needs.

In the case of VEGETEXCO, as they are far away from the manufacturer and the collaboration they could expect in their country was not too reliable, it was obvious that the service had to be given by their own team.

This was one important goal to be achieved.

Today it may still be too early to state undoubtedly that the result has been a complete success. All we can say is that the assembling of the equipment and the starting on and trial period have shown that this training has been quite successful, and these are "true" moments in which knowledge is to be shown.

ANALYSIS OF THE RESULTS

1.- Production line

As it was foreseen, a line has been installed, which works at 4.000 s.p.h. The production is just limited by the length of the oven.

All mechanical, electrical, etc... parts may be used in higher speeds. This means that the installation works very comfortably at a speed much lower than the one its capacity can offer.

I think this is a very good aspect, because in this way it contributes to the object of the project.

On the other hand, the installation incorporates the most advanced technical equipments existing in the actual market. This means that if we have achieved a correct training with this equipment, we have at the same time been able to place the technicians in the real situation of the world market in this technology, with one step-let us say-, without having had to go through different stages.

The aspect of the evenness of temperature in the whole sheet and along the whole length of the oven will allow to work with the most demanding products and with a treatment that offers the most reliable guarantee.

2.- Quality control

A modest but quite complete quality control laboratory was installed for fulfilling the function of quality control at the same level as the ones used in most medium-sized lithography factories.

With the existing elements it is possible to carry out the control of the varnish received and a control of the application of this same varnish, depending on its use.

I think that in the actual stage this laboratory will fulfil the needs of the project quite well, and I do not think that a more sophisticated investigation is a goal in a short-medium term.

3.- Preparation of the human team

There are three aspects that have always made me feel worried:

- a) Making it possible for the team to work with the coating line.
- b) Quality control
- c) Showing the team a deep knowledge of the equipment to guarantee its correct functioning.

We knew that the first aspect was not too difficult to be achieved, as there were no special skills nor knowledge involved.

The second one did not involve too many difficulties at a first moment. But there are some aspects that require a right assimilation of all that has been heard and seen throughout the training process and an important capacity for analysis. These are: the correct interpretation of the tests, the determination of the reasons that have led to that result and measures to be taken in order to correct the results.

In my opinion the level achieved is very good, although in these matters experience cannot be substituted for by any information summarized in any manual nor specific book.

Regarding the third aspect, which is in our opinion, the one involving more difficulties, we can say that we are more than pleased with the results.

We are well aware of the difficulties the Clients have with the ovens, because there are some subjects, as the fluid movement, heat transmission, etc,...that are very complex for low or medium level technicians.

I think we have made it possible for the team to know the mechanics and the electric parts of the equipment, and I do believe they will not have serious difficulties when settling any possible problem.

The most important thing is that they now are familiar and know in a relative depth subjects such as combustion, fluid balance, temperature regulation, energetic balance, etc,..... subjects that are often unknown for most users.

This may give the reader an idea of the degree of knowledge acquired in all the mentioned subjects. Whereas the level of knowledge on matters that are usually "tabu" for the users is acceptable, the team has acquired a very deep knowledge on the rest of the subjects.

I think that there is not too much more that the author can add to this final evaluation of the project.

I would like to conclude adding that collaboration and complete support are vital in the good outcome of the project, and there is no doubt that in this case we have had the most desirable collaboration.

CONCLUSIONS

In the previous sections we have indicated which were the goals. We have expressed and explained the work to be performed and how has this actual work been carried out. Also we have drawn conclusions on the finalization of each step.

In this section we will deal with the final conclusions and the results achieved.

Various technicians from INGHOR have participated in the project. We have hold meetings with them more than once and also at the end of the project in order to discuss some aspects of the work performed, the work to be carried out and the evaluation of the achieved results.

I can assure that my optimism has been, in every moment, more moderate than the optimism of the people that have been collaborating with me. I am explaining this in case the reader might think of an excessively optimistic impression of the author of this and the previous reports.

It can be easily noticed that VEGETEXCO has worked hard in the installation of the equipment and has given a lot of collaboration to the project.

In this regard, technical information has been supplied to carry out the work, but let us bear in mind that someone has been in charge of gathering that information, analyzing all its points and has finally designed a Plant which takes into account all important points, a plant in which we have noticed that nothing is missing.

All ventilation, light and access problems have been taken into consideration and have been given a good answer to.

Even the spare parts room can be a model for some companies.

Ref. DP/VIE/88/036
UNIDO CONTRACT 89/143/MK

ESTABLISHMENT OF A DEMONSTRATION TIN PLATE
COATING PLANT AND LABORATORY FACILITIES IN
THE SOCIALIST REPUBLIC OF VIETNAM

- 1.- FIRST REPORT, including site study, plant layout *
and specifications for auxiliary functions.

INGENIERIA Y HORNOS
INGEOR, S. A.

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* Drawings not included in ANNEX 1 to Final Report

HEADLINE

This report will try to define the minimum requirements necessary for the setting of a coating section in a metal package factory.

The report deals in the first place with the location of a first complete production line with all services and facilities necessary for it.

It also deals with a possible future enlargement and finally, it defines all necessities for the installation of the production line itself, such as electric power, combustible, compressed air, etc.

Name of the author of the report : ANICETO EIZAGUIRRE BASTERRECHEA

Reference of the contract : DP/VIE/88/036
UNIDO CONTRACT 89/143/MK

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S U M M A R Y

With this report we intend to give all information, drawings* and advices necessary for the installation of a coating section.

In the first place, the report deals with the design of the industrial pavilion which will house the first coating line with all necessary exterior facilities, such as : raw material warehouse, quality control Laboratory, workshops, etc.

Secondly, we deal with the possible enlargement for new production lines.

In the third place, the report deals with the possibility of enlarging the line that will be installed next year, (for reaching higher productions).

In the fourth place we explain the conditions in which the line is supplied and the needs of laying foundations, supplying electric power, combustible, compressed air, etc.

Finally, we enumerate a series of additional advices in order to obtain the best work conditions regarding cleanliness, quality of the product, control of the same and also to obtain the best possible production.

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* Drawings not included in ANNEX 1 to Final Report

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- 1º) Situation and actual problems of the coating process.
- 2º) Facilities required for a coating plant.
- 3º) Installation of a coating line.
Requirements of the production line itself.
- 4º) Possibility of converting this pilot line in a great production line.
- 5º) Study of the possibility of enlarging the plant installing new lines.
- 6º) General advices which, together with the previous paragraphs, make up the functioning conditions that will help obtaining a larger production of the best quality.

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I N T R O D U C T I O N

Basically, with this report we intend to supply all necessary technical elements so that VEGETEXCO can have everything ready to receive the coating line and install it right away in the minimum time possible and in the best conditions.

For this purpose we enclose general drawings * of the installation in which we indicate all in-take points of electric power, combustible, compressed air, all necessary laying of foundations, etc.

This information will be enough for VEGETEXCO to carry the work out before the production line arrives into the factory.

We also enclose section drawings* of the oven in the points where chimneys are to be built.

Therefore this will be the first package of technical information for the correct preparation of the elements and steps necessary for the installation of the production line.

This report also contains a second group or package of drawings. A plant distribution has been designed, which foresees all facilities required by a coating section of tinplate sheets.

This drawings have been done following the most common systems used in countries where this kind of work has long tradition.

This second package of drawings is not final and it is subject to modifications depending on accessories, needs and some other conditions. The important thing is to understand the spirit of the presented design and maintain this spirit regardless of the changes performed.

It is clear that all proposed services are necessary.

* Drawings not included in ANNEX 1 to the Final Report

It is also clear that the front side of the line is the work, control and operation point of the same, as well as the main information point of the line.

Therefore the main services, (such as quality control laboratory, raw material warehouse and management of the plant) should be located near this area.

There is no doubt either about the location of the tinsplate warehouse and the finished product warehouse. The toilettes, workshops, etc. are the only ones that may present more possibilities of variation.

In a third package or group of drawings we will give orientation on the possibility of future enlargements of the coating section by installing new lines.

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PRELIMINARY SECTION

As we have described previously, this report is basically an information report dealing with the substructure VEGETEXCO will have to carry out in order to receive the coating line. The report is not limited to the line itself, it tries to create something else, i.e. the substructure or underlying structure necessary for a tinplate coating plant, thinking in future enlargements.

Therefore it is essential to enumerate the enclosed technical information :

- 1^o) Horizontal and vertical drawings* of the supplied line.
- 2^o) Section drawings* of the general drawing in order to define exactly the chimney points.
- 3^o) Drawings* of foundations for the line, including ducts for electric connection, feeding of compressed air and combustible.
- 4^o) Location of the plant in the initial pavilion indicating all necessary facilities.
- 5^o) Ideas for future enlargements.

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* Drawings not included in ANNEX 1 to Final Report

MAIN BODY OF REPORT

1°) SITUATION AND ACTUAL PROBLEMS OF THE COATING PROCESS

During our visit to the metal package factory of VEGETEXCO in Vietnam we noticed that the manufacturing process is carried out in a very rudimentary way and with very old machinery and methods. Thin welding is still performed, and it is done manually.

We also saw an old continuous coating line with combustion chambers in extreme situations, which will not allow the correct functioning of the line for a very long time.

Even if we could not check the quality of the coating, we do not think it offers any guarantee.

What most worries us when thinking on the next equipment is the quality of the tinplate.

In the first place, the piling of most tinplate bundles did not fulfil the minimum requirements for its posterior use in automatically fedded coating lines.

On the other hand, most bundles had been knocked and the ends of the sheets were folded. Also the quality of the corners of the sheets did not offer any guarantee as they were roughly cut.

Conclusion

In order to work in a modern coating line with automatic feeding and unloading it is absolutely essential to use tinplate that fulfils the minimum requirements. It will be impossible to use most of the piles we saw in the new line. The problem lies not only in the poor production; the most serious aspect is that with the badly treated tinplate the machinery will suffer in all its elements, above all in the conveying belt, suckers, rubber wheels and of course in the coating roller.

..//..

It will be clearly impossible to enter in some markets as long as the tin welding is used, as most of the markets require a minimum content of lead. VEGETEXCO told us that in a short period of time they intend to acquire electric welding machinery, which will solve this problem.

The line to be supplied is prepared to do stencil coatings in the most demanding conditions, such as the electric welding. This welding system needs a very sophisticated equipment regarding the positioning of the sheet in the coater. Naturally this complex system requires the use of high quality tinplate.

2º) FACILITIES NEEDED IN A COATING PLANT

A coating plant requires the following services :

a) Tinplate warehouse

It must be located near the front side of the machine. As bundles are piled one on top of the other up till 5 or 6 piled bundles. The floor will have to be able to support at least 10.000 kg/m^2 .

b) Finished product warehouse

Characteristics should be similar to the tinplate warehouse. It should be located near the end of the line.

c) Raw material warehouse

Solvents, coates, cleaning cloths, rubber rollers, etc. will be stored in it.

It should be located near the front end of the machine. It should be correctly ventilated in order to avoid gas accumulations and it should fulfil safety requirements demanded by law in places where combustible products are stored.

d) Laboratory for tests

It is or it should be the fundamental part in the coating process.

...//...

This Laboratory should fulfil the following functions :

- I) It should have complete information on the coatings and solvents used.
Under this point of view it will give the Plant Manager appropriate information so that the line can perform its varnish application and polymerization correctly.
- II) It should control the quality of the tinfoil arriving into the factory and carry out a report of each batch.
- III) It should control the quality of the coatings received and carry out tests with its manual varnish applying device and the laboratory oven to check that the solid percentage agrees with the information received on that varnish and on the resulting quality.
- IV) In the front side of the machine, it should control the weight of the wet film applied on the sheet.
Usually and quite regularly the Plant Manager will check if the varnish film is correct and even, and if it is applied without marks or pores in all the sheet surface.
Every hour, it will be necessary to perform a more complete test, checking the film weights.
- V) This Laboratory should continuously and sequentially check the quality of the coating at the end of the process.
This test will be carried out to know about :
 - a) The weight of the dry film
 - b) The non-existence of pores
 - c) Quality of adherence
 - d) Degree of polymerization

As final tests, although they do not have to be carried out so often, the pressure cooker test and the deep drawn test can be performed.

The modern high production lines incorporate nowadays automatic systems of sheet ejection at the front side and at the end side of the machine. They perform sheet ejections for quality control purposes in a programmed way; i.e. every 200 sheets, and at least one visual control of quality is carried out.

.../...

e) Spare parts warehouse

It is necessary to have a warehouse in which all spare parts and materials to be used in the production line can be stored in a rational manner.

f) Auxiliary workshop

This auxiliary workshop should have a winding machine to correct the rubber rollers and a machine to sharpen the cleaning blades of the printing roller.

Both the rubber rollers and the blades should be changed often.

The quality of the tinplate is very important for the long life of the roller, because roughly cut sheets or sheets with any kind of groove can cut the roller and turn it to be useless.

Depending on the type of varnish used, the blades can last more or less hours. It is necessary to have some blades always prepared to substitute for the ones being actually used.

g) W.C. for the operators

No comment needed.

h) Room or premise for the Plant Manager

He/she can program the work and check all stages of the same in it.

3°) INSTALLATION OF THE COATING LINE. NEEDS OF THE PRODUCTION LINE ITSELF

A production line requires a series of elements for its functioning.

We enumerate them :

- I) Pavilion; built depending on the dimensions the production line needs.
The height must be 6 mts. so that the assembling and posterior maintenance can be performed easily, without difficulties.

..//..

The dimensions in the enclosed drawing provide space for future enlargement of the line to 36 mts.

Therefore we have a pavilion the sizes of which can be compared to those of the most modern installations.

- II) Together with this information we enclose a drawing of foundations so that the line can be installed without problems nor delays when it arrives.

This foundation drawing also includes the loads of the pavilion floor for the storage and transportation of tinplate.

- III) The installation also requires :

- Electric power
- Combustible
- Compressed air

Electric power, it will be installed at 380 V., 50 Hz., triphase.

The installed power should be for around 100 kw.

In the enclosed drawing we specify to which points should this connection reach.

We also indicate the ductings to be performed regarding the foreseen intake points in the pavilion.

Combustible. As we mentioned, the foreseen consumption will be 86 litres hour of diesel combustible.

As average consumption we estimate 50 litres/hour and a tank will be necessary, with autonomy or range for 15 days.

In the drawing we indicate the pumping circuit of combustible towards the burners, as well as the points that should be fed.

Compressed air. INGHOR, S.A. will supply a compressor which will satisfy the needs of the line. It should be located in a exterior booth outside the coating plant the ducting to be carried out is also enclosed in a drawing.

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4°) POSSIBILITY OF CONVERTING THIS PILOT PLANT INTO A PRODUCTION LINE

This line, considered a pilot plant will work at 4.000 s.p.h. The new coating lines work at 6.000 s.p.h. nowadays.

In the future it will be possible to enlarge the line to reach the 6.000 s.p.h. production, at present the length of the oven is the factor that stops us from reaching that production.

Therefore in the future we could enlarge the length of the oven to 36 mts., with another combustion chamber and two more meters of cooling zone.

All the main sheet conveying elements are prepared to work at the highest speed.

The new line can be seen in the enclosed drawing.

5°) IDEAS FOR THE POSSIBILITY OF ENLARGING THE PLANT BY INSTALLING NEW LINES

For this project we have taken into consideration the future enlargement of the plant with new coating and lithography lines.

The main facilities are located in such a way that in a future enlargement they can keep their position.

The only one that would need to change its place would be the tinplate and finished product warehouse. This would present no problem whatsoever.

In the enclosed drawing you can see an idea for the future solution.

...//...

6°) GENERAL ADVICES WHICH, TOGETHER WITH THE PREVIOUS PARAGRAPHS, MAKE UP THE FUNCTIONING CONDITIONS THAT WILL HELP OBTAINING A LARGER PRODUCTION OF THE BEST QUALITY

We do not want to be repetitive, but we will insist on some very important aspects regarding the right functioning of the coating line.

We think this is the right moment to give some thought to a series of aspects which can bring about the success or failure of the project.

a) Environmental conditions

In this kind of installation the cleanliness is one of the most important elements in order to obtain a high quality product.

Under this point of view the following aspects should be born in mind :

- Floor

It must be finished in such a way that it does not produce dust and it is easy to clean.

Usually a ceramic floor is placed under the platform of the coating machine so that it can be easily cleaned.

There may be some other solutions for the rest of the pavilion, such as the quartz mass or agglomeration, varnish or some other solution used in that country. Of course, the concrete is not a solution.

- Doors

Usually rubber plate doors are placed, which rotate one way or the other and which allow the pile conveying truck to go in and out, immediately closing itself after it has been opened.

.../...

- Ventilation

The best way of organizing it is : air in-take at one side in the upper part and air extraction from the opposite side by fans.

This air current from the upper part of the pavilion allows renewing the hot air of the pavilion which, by convection, goes always to the upper part.

If in normal conditions the dust does not go up as much as 5 meters it is not absolutely necessary to place filters for the air in-take. It could happen that with the wind and in special conditions, the exterior dust reaches that height, but it is not normal.

b) Quality of the products

The products used are essential for the right functioning of the equipment. The tinplate, varnish, lubrication, etc., must be of the best quality.

- Tinplate

The functioning of the line depends on this point. A line of these characteristics is prepared to work with high quality tinplate, as it has strict controls to obtain strict results at high speeds.

If the tinplate is not the right one, this does not work.

- Varnishes

The process consists on applying the varnish and posteriorly treating the applied varnish. The quality of the varnish should be high and above all, even. It could happen that you receive varnishes that are not exactly the same and then the application and final characteristics are not the same ones. It is said that the best varnish supplier is the one that obtains more uniformity in the different varnish batches supplied.

...//...

- Combustible

A perfect filtering is essential; for this purpose, progressive filterings should be carried out from the first pumping groups to the burner.

In the enclosed circuit it can be seen that there are various filtering groups, which have to be cleaned as often as the quality of the supply requires.

- Lubrication oil

All machinery must be lubricated with the adequate products according to maintenance rules.

One of the most essential elements is the lubrication oil for the conveyor, which will have to work at 200° C. without leaving waste materials.

We will previously send to you the information about the characteristics of this oil so that you can try to find it in the country.

c) Auxiliary elements

Elements which are continuously consumed :

- Rubber rollers

It is necessary to plan where and how the roller-covering will be performed.

It is necessary to have a winding machine to rectify the rubber rollers.

It is also necessary to consider that the blades have a limited life and they must be replaced.

Along with the machine we send some blades and a blade sharpener but it is always unknown how long a blade can last, therefore you should be ready to manufacture more of them.

- Conveying belt

It is necessary to change it because the tinplate can cut it in any sheet jam.

LIST OF TOOLS NECESSARY FOR THE ERECTION OF THE INGHOR CONTINUOUS DRYING OVEN

SCREWDRIVERS

- 1 Small screwdriver)
- 1 Medium screwdriver) Slat end
- 1 Large screwdriver)

- 1 Small screwdriver)
- 1 Medium screwdriver) Phillips type
- 1 Large screwdriver)

- 2 Electric or air drive screwdrivers with selection of bits

SPANNERS

- 1 Set open ended metric spanners up to 32 A/F.
- 1 Set ring spanners (metric) up to 32 A/F.
- 4 Open ended spanners (12 mm. x 13 mm.)
- 1 Set of combination spanners up to 32 A/F.
- 1 Set of socket spanners up to 32 A/F with ratchet and extrusions
- 3 Ratchet braces (13 mm.)
- 1 Box of spanners inserts :
 - 6 spanner inserts 3/8" - 8
 - 6 spanner inserts 3/8" - 10
 - 6 spanner inserts 3/8" - 13
 - 2 extensions of 3/8" ref. 1608502036

WRENCHES

- 1 Small pipe wrench
- 1 Large pipe wrench

PLIERS

- 1 Large plier
- 1 Internal airclip plier
- 1 External airclip plier
- 2 Medium mole grips

TINSNAPS

1 Pair

WIRE CUTTERS

1 Pair

SAND

1 Hacksaw

10 Sets hacksaw blades

FILES

1 10" bastard flat file

1 10" bastard round file

HAMMERS

1 400 gm. hammer

1 800 gm. hammer

1 Plastic ended mallet

1 Claw hammer (large)

DRILLS

1 Double speed electric drill (12 mm. chuck)

1 Kango hammer drill for bolts up to 20 mm.

RIVETERS

2 Pneumatic pop riveters for 4 x 10 and 6 x 12 rivets

ELECTRICAL

1 Multimeter

1 Welding set

2 Extension lamps

2 Inspection lamps

6 Spare bulbs

1 Electric distribution board

1 Electric trolley with forks height : 4 mt. -FENWICK-

MISCELLANEOUS

- 1 x 10 mm. dia. hole punch (for sheet metal)
- 1 x 250 mm. "G" clamp
- 1 Engineers spirit level (large)
- 1 Vernier calliper (large)
- 1 Scriber
- 1 Cold chisel
- 1 2 m. long rule
- 1 30 m. tape
- 1 Engineers square (large)
- 1 Plumb bob with string
- 1 Oil can
- 1 Set of piano wire
- 1 Lever, 1 m. long.
- 1 Set of brass goggles of 0,1 - 1 mm.

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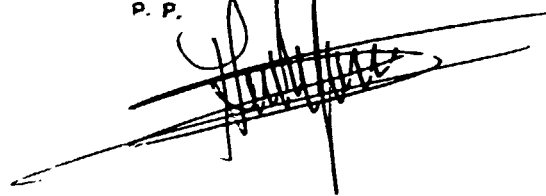
ANNEX 2

DP/ VIE/ 88/ 036
CONTRACT 89/ 143/ MK

DEMONSTRATION FOR TINPLATE COATING LINE, VIETNAM
2nd REPORT (after the training process)

VARNISH APPLICATION TECHNIQUES FOR
TINPLATE SHEETS FOR ITS POSTERIOR
USE IN THE MANUFACTURING OF CANS FOR
THE FOOS INDUSTRY

INGENIERIA Y HORNOS
INGEOR. S. A.
P. P.



Bilbao, 18th of June, 1990
Written by ANICETO EIZAGUIRRE BASTERRECHEA

TITLE

The subject of this report is the training process carried out in Spain by a team of technicians from VEGETEXCO, (Vietnam).

The mentioned report can be summarized by the generic title of :

VARNISH APPLICATION TECHNIQUES FOR TINPLATE SHEETS
FOR ITS POSTERIOR USE IN THE MANUFACTURING OF CANS
FOR THE FOOD INDUSTRY.

Dates of training : 29 March to 25 May, 1990.
Elaboration of report : June, 18th, 1990
Name of the author : ANICETO EIZAGUIRRE BASTERRECHEA
Contract Ref. : DP/ VIE/ 88/ 036
CONTRACT 89/ 143/ MK

SUMMARY

This report sets about to give the reader an idea about all aspects that have been covered during the TRAINING and about the intensity of the activities that have been carried out.

In this sense, we will make a only conceptual classification (we will not make use of any chronological classification). In the last chapter we will explain the results that have been achieved in this time as well as the complementary activities we suggest.

TABLE OF CONTENTS

PRESENTATION

1.- RAW MATERIALS USED

- a) Varnishes and solvents.
- b) Tinplate.

2.- QUALITY CONTROL

- a) Elements used in the quality control processes.
- b) Quality control process in the coating lines.

3.- COATING LINE

- a) Theoretical study (using drawings) of the different elements which make up the installation.
- b) Practical study of these elements in their advanced manufacturing stages.
- c) Visit to various Spanish factories in order to see complete coating lines functioning.
- d) Participation in the quality control process, final adjustments and testings on the mentioned equipment.
- e) Study of the training and handling of special equipment, such as controllers, recorders, programmer, burners, speed variators, etc...

4.- COATING TECHNIQUES

This training, carried out in three Spanish companies has included:

- a) Handling of coating line.
- b) Additional techniques, such as:
 - Smoothing of rollers,
 - Sharpening of blades,
 - Handling and preparation of varnishes,
 - Cleaning of machines,
 - Roller preparation for performing stencil coatings, etc...

5.- EVALUATION OF THE WORK THAT HAS BEEN CARRIED OUT AND SUGGESTIONS ON COMPLEMENTARY ACTIVITIES, NECESSARY TO MAKE THIS PROJECT FULLY SUCCESSFUL

FINAL SUMMARY

PRESENTATION

This report is divided in two different parts. In this first section we will enumerate all the jobs that have been carried out as well as the reasons that have forced us to perform them the way we have done. This way, the reader will be able to understand globally the extent of the work regarding the studied concepts. At the same time, the reader will be in a position to evaluate the depth of these studies, because the author of this report has carried them out guided by his criterium, although we have had quite a regular exchange of ideas and criteria with the different parts involved in the project.

Therefore, we believe that a deep knowledge of this report will help all of us in fulfilling its last stage more accurately and successfully.

The second part of the report includes the opinion of the author of this report, his feelings about the extent of the knowledge on the work we have carried out assimilated by the team from VEGETEXCO in general terms. Also, this section deals with particular aspects of the learning process, suggesting possible future actions to complete the knowledge of these technicians so that this project fully successful now and, what is in our opinion very important, in the long run.

1.- RAW MATERIALS USED

A) Varnishes and solvents

In the first place we studied - in the offices of INGHOR, and with the help of our technicians - the performance of the different varnishes used in the coating lines: sanitary varnishes, base varnishes, finishing varnishes and enamels.

We also studied the varnish films to be applied, curing times, performance in the machine, etc... We discussed the present and future needs of VEGETEXCO, and with this information a questionnaire was elaborated for the meeting to be held posteriorly in PRISMA, S.A. (varnish manufacturers).

The purpose of the meeting was to acquire basic knowledge on this matter and somehow, to prepare the technicians so that their stay in PRISMA, S. A. would be most profitable.

The following work was achieved, during a period of two days, in the mentioned company:

- Visit to their production department and to their raw-material warehouse, as a way of introducing the team to the varnishes.
- Practical study of the quality control process in the factory.
- Meeting with the technicians from PRISMA, S.A., in which the main subject was the use of varnishes in different canning processes, such as:
 - * Canning of various types of fruit
 - * Canning of vegetables
 - * Canning of fish
 - * Canning of meat products

This meeting was also used to study the uses of the varnish in each one of the processes, focusing on present and future trends.

PRISMA, S.A. prepared an extremely interesting report on technical data, which was given to the trainees.

Summarizing, in the course of these two days the following two goals were achieved:

- Acquire knowledge and practice in the quality control testing in the laboratory. Discussion of the most common problems that may

arise in every day work.

- The trainees received a very interesting lesson on the use of varnishes in the canning of different types of food.

B) Tinplate

The technicians' team from VEGETEXCO visited the company ALTOS HORNOS DE VIZCAYA, which, in its factory or ETXEBARRI produces tinplate. The visit was basically a good way of being introduced into the tinplate world by means of the techniques used by the company.

The trainees showed very much interest on the different kinds of tinplate used in the market for different applications, the mechanical characteristics of the material and the different coatings used. The technicians had the opportunity of asking and clarifying their doubts about this aspect, which seemed to be unknown to them.

The company ALTOS HORNOS DE VIZCAYA gave the trainees a very complete dossier on the tinplate (classification, quality, etc..). This material can be very interesting for the trainees in their interest on deepening their knowledge on the basic material for the manufacture of cans.

Although it may be true that the problematique of the tinplate is more related to the can manufacturer than to the coater, we think it is very important for the people responsible of the coating process to know - at least in an elementary manner - the material with which they will have to work daily, without forgetting that the equipment are designed for a can manufacturing line, not only for a sheet coating one.

2.- QUALITY CONTROL

A) Elements used in the quality control processes

The trainees from VEGETEXCO visited the company NEURTEK, S.A., which specializes on the supply of laboratory equipment.

In the course of this visit the technicians had the opportunity of seeing all the laboratory equipment they will have in the future. The trainees also received explanations from the technicians of NEURTEK, S.A., and they were given the opportunity of doing some practical studies on all the elements.

B) Quality control process in the coating lines

In the first place they had the opportunity of following up the quality control process on a lithography line in the company CROWN CORK - METALINAS, S.A.. This company has a well equipped laboratory and, what is more important, they have systematized all the quality control processes used by CROWN CORK in all their factories.

The director of the Quality Control Department of the factory, who showed them the installations, gave special importance to the systematization of this process.

Secondly, they had the opportunity of seeing the opposite of CROWN CORK in the company named RECUBRIMIENTOS Y DECORACIONES, S.A. (RECUDESA) during a period of one week in Calahorra. In this company, all quality control is carried out in an aleatory manner. Nevertheless, they were able to appreciate the differences between two companies, an extremely well organized one and a roughly organized one.

In the third place, they spent another week in the company LITOGRAFIA ALVESA, S.A. (LITALSA) of Oyón. This company has a very good reputation in Spain for its high quality lithography. They have a good quality control department, where the trainees had the opportunity of practising and comparing the working methods.

They also visited the company METALGRAFICA DEL NERVION, S.A., of the CMB Group, specially their laboratory facilities.

3.- COATING LINE

A) Theoretical study (using drawings) of the different elements which make up the installation

The first job was to study the complete coating line. This study was carried out machine by machine, mechanism by mechanism. Maybe this process, very intense and tiring, has been difficult to assimilate, but we believe it was very important for the trainees to study what they were later on going to see.

This study proved to be very convenient, as the technicians from VEGETEXCO were capable of relating the information more easily.

B) Practical study of these elements in their advanced manufacturing stage

After the theoretical study of the line, we visited our workshops in order to complete the knowledge of the different elements that make up the installation.

We gave special importance to the study of the mechanical parts of the installation, easy to understand when the individual machines can be seen and analyzed. We studied the different mechanisms of each one of the machines, focusing on the manufacturing of the mechanisms and on their function in the context of the whole machine.

C) Visit to various Spanish factories in order to see the complete coating lines functioning

The trainees had the opportunity of seeing the equipment functioning in the factories mentioned in paragraph 2, B).

The theoretical knowledge acquired previously proved to be very useful, as the trainees were able to confront it with the actual functioning of the machines.

D) Participation in the quality control process, final adjustment and testings on the mentioned equipment.

Participating in these processes with our technicians has helped the trainees from VEGETEXCO to acquire a deep knowledge of the methods and machines used.

E) Study of the training and handling of special equipment, such as controllers, recorders, programmer, burners, speed variators, etc...

We all know that nowadays we can not succeed without assimilating and adapting ourselves to the new techniques. In this sense our installation incorporates various high - technology and very sophisticated equipment.

Generally these equipment have multiple applications, and we have to programme them in order to adjust them to the functions we want the machine to carry out. This happens with some of the elements mentioned in the headings.

We have also considered it was interesting for the technicians to perform testings with these equipment, and accordingly we let the trainees handle the machinery on their own so that they could become familiar with it. With did the same with the gas - oil burner, first with the manufacturing technicians and later on in an installation which was already working.

4.- COATING TECHNIQUES

A) Handling of coating line.

During the stay in the mentioned factories (Paragraph 2,B), the trainees from VEGETEXCO spent many hours with the technicians and the people working with the machines. They had the opportunity of having a direct experience on the problems that may come up in the functioning of a coating line.

B) Additional techniques

The work was simple and easy when it came to handling the line. The most difficult part of the task involved in the preparation and adjustment of the machinery, where the trainees deepened their knowledge considerably.

In this sense we noticed the technicians from VEGETEXCO were very interested on the stencil coating machine, in the preparation of the rubber rollers, adjustment and sharpening of cleaning blades, handling of coatings and on the solution of the problems that usually arise in this kind of processes.

In one word, what the trainees did was to obtain the necessary knowledge to use it properly later on a new installation.

5.-EVALUATION OF THE WORK. SUGGESTIONS ON COMPLEMENTARY ACTIVITIES

In the first place, the author of this report feels obliged to express the interest shown by VEGETEXCO by choosing such a well prepared team of technicians.

During the time they have been with us they have shown a great capacity for assimilating information and great interest to learn. We want to carry out this evaluation focusing on three main points:

- 1st: Quality control
- 2nd: Handling of equipment
- 3rd: Knowledge on the equipment

1st: QUALITY CONTROL

We believe the trainees know this technique perfectly; they have had the opportunity of visiting very different companies and we are certain that they have been able to difference good and not so good aspects of the way these companies run their installations. This is the only way they can develop their own criteria.

Everything can be improved and a lot of time is needed in order to feel confident in a new job or process. Still, we think the trainees have acquired a good body of knowledge they can start with, on matters such as quality control and performance of testings.

We know that solving the actual problems that may arise in their line may be a completely different matter, but we think experience will be their best help, together with the collaboration of the varnish specialists and equipment manufacturers (INGHOR, S.A.).

In this sense, we have had the same experience in many Spanish lithography companies, where they have had to turn to the technicians of the varnish manufacturing company for help.

2nd: HANDLING OF THE EQUIPMENT

This stage has also been easily assimilated by the technicians from VEGETEXCO. We believe they have carried out a good learning process in this sense, although they have never confronted their knowledge in a real situation in which they will be alone, on their own. This is very important and we think it is something we have to check when the line starts operating in VEGETEXCO.

Once the machine has been started on, we will have to let them work on their own to detect possible deficiencies, if there are any.

We will now enumerate the various machines in order to try to bring the reader into a real situation:

FEEDER It is quite a simple piece of equipment, easy to know and handle, and we believe it represents no difficulty in normal conditions.

Nevertheless, the performance of the machine may change depending on the tinfoil quality, the bundle quantity, the varnish, and so on. The equipment has many adjustment possibilities to compensate the different kinds of tinfoil.

We believe the trainees are now in a position to analyze different solutions regarding adjustments for each situation. After having worked on this for some time, this task will turn out to be a very easy one.

COATER This may be the most complex machine of the whole installation. We believe the trainees will have no problem whatsoever in the normal handling of this equipment; Nevertheless, any failure could become a serious problem, due its complexity.

In this sense, we have tried to give them a deep knowledge of the equipment in the various assembling stages, so that they could study parts of the machine before the total assembling.

We will supply drawings of the different parts of the machine. This is something we usually do not do, as this documentation is very valuable for manufacturing the machine,

The coating machine also needs some auxiliary actions, such as: handling of varnishes and solvents, smoothing of rollers, blades and so on.

The technicians from VEGETEXCO have experienced all these tasks, and they showed very much interest on all the activities. They also took many notes, which will be a great help to them later on.

Regarding the rest of the equipment: oven, stacker, and bundle turner, we can say they are more simple machines and the technicians will find these are much more easy to run.

When it comes to running the machine, the most important aspect may be the maintenance. We will give much attention to this when the trainees receive the handbooks.

3rd. KNOWLEDGE OF THE EQUIPMENT

This is, in our opinion, the most critical point in this kind of installation.

When tinplate and varnish materials used are good quality ones it is not likely that the trainees will have to face any serious problems. Also, experience will give them the capacity to solve the most common problems.

Only the lack of knowledge on the equipment can causes failures and irregular production. This is why we have given special attention to this aspect. We have taught theoretical and practical ideas on the manufacture of the equipment, various parts and so on.

We have been specially careful on two aspects. One has been the auxiliary equipment incorporated by the machine, such as: temperature controls, variators, burner,... In this regard, we have noticed the results have been very encouraging.

The other aspect has been the purely mechanical one, may be the most difficult one to evaluate. We think the results may be good, although we will have to confront them in the assembling and starting on of the machines. This is, in our opinion, the only aspect that could hinder the success of our work.

Nevertheless, we feel optimistic bearing in mind the capacity the trainees have shown on learning some other aspects.

FINAL SUMMARY

Generally speaking, we are very pleased about the work that has been done, and getting into detail we can say that during the training period the following tasks have been carried out:

a) Knowledge of raw materials

The trainees have now an elementary knowledge on the raw materials used in the process: tinplate, varnish and solvents. We have not gone into excessive depth, because the subject is overwhelming. Nevertheless, the trainees have acquired a good basic body of knowledge.

b) Quality control

Regarding the quality control we can say that the technicians have learned every aspect of the techniques used. Experience will teach them how to detect and correct problems.

The problems that may arise in relation to Paragraphs a) and b) are usually discussed and solved with the varnish supplier, who usually will have a technical team to assist the customers. Therefore it is very important to find a varnish supplier who will guarantee this type of service, which can be of great help even to experienced customers.

c) Knowledge of the equipment

The knowledge of the equipment must be completed in the assembling stage. This may be the most tricky aspect of the whole process, as it is very difficult to evaluate. In this sense, the additional documentation we will supply will be very helpful.

Naturally, there is always the possibility of contacting the equipment manufacturer (that is: INGHOR, S.A.). If the question is correctly expressed, either orally or in written, it will be easily solved.

This has been the summary of the actual situation and the results of the TRAINING process carried out in Spain from the 29th of March to the 25th of May.

ANNEX 3

DP/VIE/88/C36
CONTRACT 89/143/MK

**DEMONSTRATION FOR TINPLATE COATING PLANT,
VIETNAM**

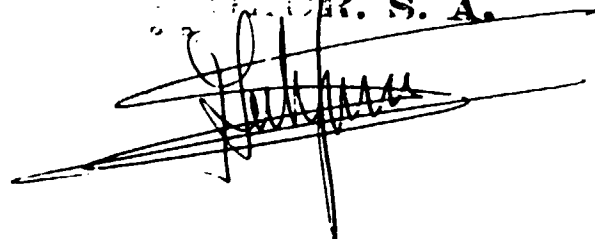
Third Interim Report

ASSEMBLING OF THE INSTALLATION FOR
COATING AND DRYING TINPLATE SHEETS

Bilbao, 20th of Novemeber, 1990

Written by: ANICETO EIZAGUIRRE BASTERRECHEA

**INGENIERIA Y HORNOS
S. A.**

A handwritten signature in black ink, appearing to be 'Aniceto Eizaguirre Basterrechea', is written over a horizontal line. The signature is stylized and somewhat illegible due to the cursive nature of the handwriting.

TITLE

The present report covers the "ASSEMBLING" of a tinsplate coating and drying line carried out in the factory of VEGETEXCO, located in Ho Chi Minh City (Vietnam). The purpose of this line is the manufacturing of cans for the food canning industry.

The title of this report is:

"ASSEMBLING OF THE INSTALLATION FOR COATING AND DRYING TINPLATE SHEETS"

Dates of the
assembling process: 8 October to November, 1990.
Date of the report: November, 20, 1990
Name of the author: ANICETO EIZAGUIRRE BASTERRECHEA
Contract reference: 89/ 143/ MK

SUMMARY

The present report will show that the assembling process has been completed and that the installation is ready for the next stage, the commissioning process.

In this sense, we will enumerate the different parts of the line in order to give the reader a general idea of how did we carry the assembling of each part of the installation.

TABLE OF CONTENTS

In this chapter we will enumerate the parts making up the installation and at we will also explain is the process we have followed in order to assemble each one of them.

1st Assembling of the tunnel of the oven

- a) Levelling of the floor.
- b) Assembling of panels.
- c) Interior of the tunnel.
- d) Cooling chamber.

2nd Assembling of the combustion chambers

- a) Platforms.
- b) Chambers.

3rd Assembling of the conveying belt

- a) Entrance and exit tables.
- b) Superior and inferior guides.
- c) Conveying belt.
- d) Wickets.

4th Head and rear machines

- a) Feeder and coating machine.
- b) Stacker.

5th Chimneys

6th Installation of gas-oil and burners

7th Electric installation

- a) Electric boards.
- b) Connection of the various elements of the installation.

8th Compressed air line

9th Bundle turner

10th Blade sharpening machine

INTRODUCTION

The present report can be divided in four clearly different parts:

- * In the first place we will describe the process carried out to assemble the oven in itself. This oven has been assembled meter by meter until the desired tunnel length has been reached.
- * Secondly, we will study the parts of the installation that are supplied already assembled, such as: Feeder, Coater, Stacker, etc... We will describe the method used for the perfect fitting and aligning of these machines.
- * The third group will be related to the electrical installation, gas-oil installation, and compressed-air installation.
- * The fourth and last group is made up of what we could call accessories of the installation, such as: Bundle turner, Blade sharpening machine, etc...

BODY OF THE REPORT

Following to what we have indicated in the table of contents, we will enumerate one by one all parts of the report, studying them in depth.

1st Assembling of the tunnel of the oven

a) Levelling of the floor.

In the first place, and once the location of the oven was chosen, the operators proceeded with the levelling of the floor, using the tools and machinery necessary for the task.

Once the surface was satisfactorily levelled, the main axle of the installation was marked as a reference point for the whole assembling process and for the aligning of the machines.

b) Assembling of the panels.

Once the distance (in width) of the tunnel was measured, the operator proceeded with the placement and fastening of the dilatation guides on which the oven panels will rest posteriorly.

The placement of these guides was carried out with extreme care, as they are vital points, due to the reason that in the case of dilatation, the sliding of the whole tunnel is done on them.

The assembling of the tunnel was carried out meter by meter, up till the required 24 meters. Each meter is made up of the following elements: 2 central panels, 1 roof panel and an intermediary panel.

At the end of this stage, the exit and entrance pieces (facades) were placed, as well as the corresponding fume extraction hoods.

c) Interior of the tunnel.

The assembling of this part of the installation includes the aspiration and propelling channels with their corresponding valves located along the length of the whole oven. Also, in this stage of the assembling process the technician carried out the placement of the floor baffles and the side baffles, located in the first seven meters of the oven. Inside the tunnel the assembling of the superior guides of the conveyor can be included. We will describe this issue later on.

d) Cooling chamber.

Next to the exit of the oven and separated by a distance of 1 meter the 4 meters corresponding to the cooling zone were installed. This cooling zone had been perfectly aligned with the rest of the oven, as the superior guides of the conveyor were going to lean on it.

2nd Assembling of the combustion chambers

a) Platforms.

First of all the supports of the combustion chambers were placed, although they were not fastened from the very beginning. Previously the supports, which for packaging reasons were supplied unattached, were attached.

b) Chambers.

Next, the operators proceeded with the fastening of the combustion chambers to their supports, checking the perfect alignment of the aspiration and propulsion holes with the oven. This is the reason why the supports are left unfastened in the beginning.

Afterwards, and after having checked the alignment, the supports were levelled and the operators proceeded with the fastening of the chambers.

3th Assembling of the conveying belt

a) Entrance and exit tables.

Taking as a reference the central axle of the oven (the one we have mentioned in paragraph 1-a) and the different markings in the drawing, the operators proceeded with the installation of both machines. The result was the perfect alignment of these two.

b) Superior and inferior guides.

Taking the sprockets of the Entrance and Exit tables as a reference of the beginning and end of the oven, the sections of the superior guides of both the left and right sides were placed. This was done with the help of a rope and some other tools, in order to achieve a perfect alignment.

As these guides were being placed, and due to the reason that they were a firm support to us, the interior air impulsion and propelling valves were regulated.

For the assembling of the inferior guides of the chain a process similar to the one we have just described was followed, in order to achieve a perfect alignment and parallelism between the guides.

c) Conveying belt.

Once the entrance and exit tables had been correctly placed and with the guides correctly aligned, the operators proceeded to the assembling of the chain by stretches (it is delivered in pieces of 5 meters).

When the chain was located in the superior part, a wicket was placed for every meter of the chain in order to check the separation between the guides. Afterwards the whole chain was moved to the inferior part and the superior part was again furnished in order to proceed with the adjustment and tautening of the chain.

d) Wickets.

Once the whole chain had been installed, the operators proceeded to assembling the wickets leaving a free space of 3 meters, which could be used as an entrance to the tunnel in the commissioning stage.

After having placed the wickets the operators proceeded with giving 2 or 3 turns to the whole conveyor in order to check that the separation between guides was the correct one and that there was no jam in the movement of the conveyor.

4th Head and rear machines

a) Feeder and coating machine.

After having laid the necessary foundations (pillow block), the operators proceeded with setting the right location, alignment and level of these machines.

Once the coating machine was installed the mechanical joining was carried out: transmission machine-oven between the coating machine and the synchronization group.

Finally all this elements were fixed to the floor.

b) Stacking machine.

This machine was installed next to the exit table, at the end of the line. It was fixed to the floor after having been perfectly aligned and levelled.

5th Chimneys

The assembling of the chimneys was done once the combustion chamber, the cooling chamber, the solvent fan, and the aspiration fans of the front and exit hoods were installed. These are the corresponding chimneys:

- One for the aspiration fan at the entrance hood
- One for the aspiration fan at the exit hood
- Two for the fume extraction fans of the combustion chambers
- Another one for the solvent aspiration fan
- Two for the cool air impulsion of the cooling chamber, and
- Two for the extraction of hot air in the cooling chamber

6th Installation of the gas-oil and the burners

The assembling of this group was made up of the following elements: combustible tank, pumping group, de-aerators, filters, pass valves and burners.

Once all these elements were installed in their corresponding places, the operators proceed with their joints by means of the most appropriate pipes and small whips.

7th Electric installation

a) Electric boards.

The electric board of the oven was placed on one side, at the front side of the tunnel, and the board of the coater was installed on a pillow block, in front of the machine, as in the drawing. Both electric boards were perfectly fixed onto the floor.

b) Connection of the various elements of the installation.

The connection of the motors pumps, thermocouples, electrovalves, etc.... which make up the installation was done starting from the electric boards and with the wire types and sections indicated in the drawings. All the wires were perfectly identified by their corresponding different numbers and colours.

A special hose through of 200*100mm was mounted on the sides of the ovens in all its length. This hose through, which will give access to the different points of the connection, will also be used to have access to the different elements placed on the oven.

8th Compressed-air line

The assembling of the group with the compressing engine and the air pipes was assembled to proceed with the connection of the various points of the installation: Feeder, Coater, and Exit table.

9th Bundle turner

The operators looked for the best place for the location of this machine; it had to be a spot to which the fork-lift truck had access. The floor space on which it would be located was levelled, and finally the machine was fixed onto the floor.

10th Blade sharpening machine

This machine was fixed on an appropriate support table. The best height for the operators was selected, in order to make it easier for them to work with the machine.

FINAL SECTION

In short, the assembling of the installation and its accessories has been carried out according to the foreseen plan. This plan had been based on the experience of many years working in this kind of installation.

We have had quite a lot of help and cooperation from the personnel of the factory in all the assembling stages. We are also very pleased by the interest and attention paid by the mentioned personnel. We trust they are in a position to face possible anomalies that might arise in the installation.

TOGETHER :

ANNEX 4

The UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION "UNIDO"
Represented by Bernard ANZIANI CTA VIE 88/036

The GOVERNMENT OF THE SOCIALIST REPUBLIC OF VIETNAM
Represented by NGUYEN VAN TIEP *Chief of FCRI HCMC*
PROJECT ASSISTANT.

INGENIERIA Y HORNOS INGHOR, S.A.
Represented by Aniceto EIZAGUIRRE BASTERRECHEA.

CERTIFY :

That as per contract between UNIDO/INGHOR, number 89/143, Project number DP/VIE/88/036, Activity code JI 3320, Inghor has supplied the machinery and equipment listed in the mentioned contract to the Government of the Socialist Republic of Vietnam. This machinery makes up a demonstration Tin Plate Coating Plant and Laboratory Facilities.

After having carried out the assembling process, functioning trials and commissioning of the installation, and having verified the results of the analysis, trials and tests, it is considered that the Plant has fulfilled the requirements stated in the Clauses 2.08 and 2.09 of the mentioned contract.

The present Certificate is signed, in conformity with its contents, in Ho Chi Minh, on DECEMBER, 8th, 1990.

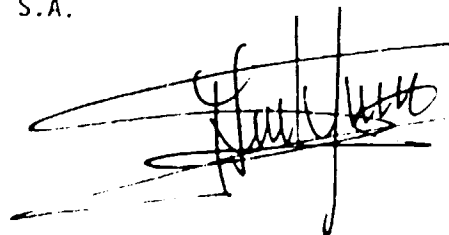
For UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION "UNIDO"



For the GOVERNMENT OF THE SOCIALIST REPUBLIC OF VIETNAM



For INGENIERIA Y HORNOS INGHOR, S.A.



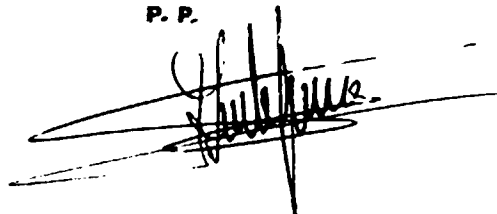
TITLE

The actual report is intended to cover the assembling and final tests of a plant for coating and drying tinplate and the laboratory tests carried out with different qualities and tinplate types used in the factory of MY CHAU of VEGETEXCO located in HO CHI MINH (VIET NAM).

This report can be summarized by the general title of:

**"STARTING ON, FINAL TEST AND LABORATORY
TESTS OF THE INSTALLATION FOR COATING
AND DRYING TINPLATE"**

INGENIERIA Y HORNOS
INGEOR, S. A.
P. P.



Date of tests : December 8th, 1990
Date of report : January 2nd, 1991
Name of author : Aniceto Eizaguirre Basterrechea
Ref. of contract : DP/ VIE/ 88/ 036 CONTRACT 89/ 143/ MK

SUMMARY

This report will describe the procedure of the tests carried out on each of the elements of the installation up to the completion of the total functioning of the whole line.

We will also describe all the quality control tests carried out on the coated tinfoil: thickness of layer, adherence, polymerization, etc...depending on the characteristics given by the suppliers of the different varnishes.

TABLE OF CONTENTS

In this section we will enumerate the different parts which make up the report dividing them in five large groups: initial tests, tests with oven in temperature, sheet feeding and unloading, and finally, varnish tests. We will also develop the part corresponding to the final tests of the installation.

A. INITIAL TESTS

1. Lubrication of the installation.
2. Tests with fans.
3. Conveyor.
4. Lubrication pump of the conveyor.
5. Entrance and exit tables.
6. Stacker.
7. Feeder and Coater.
8. Synchronization between oven and conveyor.
9. Burners.
10. Gas-oil pumping group.
11. Air distribution inside the tunnel.
12. Bundle turner.

B. HEATING TESTS IN THE OVEN

1. Burners and temperature regulation.
2. Temperature curve.
3. Consumption rates.

C. TESTS OF FEEDING AND UNLOADING OF SHEETS.

D. TESTS OF VARNISH APPLICATION.

1. Adjustment of the machine for its functioning.
2. Tests with different varnishes and tinplates.
Results.

E. FINAL TESTS OF THE INSTALLATION.

F. FINAL SECTION

A.- INITIAL TESTS

1. Lubrication of the installation

Before starting on any mechanism of the installation, the technicians proceeded to clean, oil and lubricate all points of the machine such as bearings, sliding devices, chains, mobile elements, and so on.

The chains were also correctly tightened, together with the chains of the fans, etc,...

2. Fans

Tests for all the fans of the installation were carried out separately: entrance hood aspiration; solvent aspiration; recirculation fan, air renewal fan and fan for fume extraction of the 1st zone; recirculation fan, air renewal fan and fan for fume extraction of the 2nd zone; aspiration at the exit hood and cooling fans.

In all of them, the following aspects were tested:

- * Right starting on (Star-Triangle for both recirculation fans)
- * Turning direction
- * Revolutions per minute
- * Absence of vibrations
- * Consumption of motors
- * Safety devices (pressure-switches)

3. Conveyor

The correct dragging of the conveyor chain was tested by means of the head machine motor and the back dragging motor adjusting this last one until achieving an even movement without sudden abrupt movements of the chain.

At the same time the technicians tested all existing safety devices for the stopping of the conveyor in the event of a jam or a wrong positioning of the sheets, both at the entrance and exit of the oven.

4. Lubrication pump of the conveyor

First of all, the functioning of the pump was checked: turning direction, manoeuvre of shaking the oil, oil dosage by means of the corresponding electrovalve.

All joints between raccords, pipes, dosage devices, etc... were tested so that there was no oil leak in any of them. Finally the correct application of the oil in the chain itself was tested.

5. Entrance and exit tables

The technicians carried out the adjustment of the sensors of the entrance table for the electromagnet manoeuvre (sheet braking), and of the lubrication signal for the lubrication pump of the conveyor.

The right functioning of the sheet feeding system was also checked, which can be adjusted to the different sheet sizes. At the same time, the functioning of all mechanisms making up this machine were tested: motor of the conveyor, reducer, motor-variator of the belts, etc...

The technicians also checked the right functioning of the sheet extraction fast belts and the slow belts for introduction of sheets into the stacker, adjusting these correctly to the frequency variators for the corresponding speed ranges, ramps, etc...

Also the correct functioning and levels of the hydraulic clutch of back dragging were checked, together with the side guides of sheet conveying and the system of sheet feeding at the exit of the cooling chamber.

6. Stacker

The mechanisms checked in this machine were:
Manoeuvres of lifting and lowering of the lift with its corresponding safety devices, both in the ascending and the descending movement, fan for air cushion and its corresponding valve, and finally, the adjustment of the side guides and front ends for the different sheet sizes.

7. Sheet feeder and Coating machine

All manoeuvres of these machines were checked to fulfil the correct functioning of all their mechanical elements and adjustments for the different sheet sizes.

In the feeder, the technicians checked the correct functioning of the lift in its ascending (2 speeds) and descending movement, with all the corresponding safety devices, metal detectors, etc...

Also, the double sheet extraction device of the feeder, which works with different sheet thicknesses, and all existing mechanisms that guarantee the correct placement of the sheet pile in the work position were checked.

In the coating machine the technicians checked the correct functioning of the varnish cleaning blade, and the starting on of the machine by means of the frequency variator installed for that purpose.

All mechanisms of adjustment of ink rollers, giving rollers, etc... were checked, together with the pneumatic clutch for the different work positions of the rubber roller, (fixed, free, and sliding) adjustments of the side guides, centring devices, pushers, etc.. for the different sheet sizes.

8. Synchronization between Oven and Coating machine

Before starting on this group, the technicians checked the control and functioning of the electromagnetic clutches of the synchronization devices as well as the adjustment and positioning of the sensors used for this manoeuvre. The tautening of the different chains that make up this group was also checked.

Afterwards, once the oven and the coating machine were in movement, the synchronization test was carried out, checking posteriorly the correct functioning of all manoeuvres relating to this synchronization: increase and decrease of speed in the line, stopping of synchronization, stopping of conveyor and coater in the event of lack of sheets in the oven, etc...

9. Burners

Depending on the amount of Kgs/hour to be burned and also on the work pressures, the technicians placed appropriate injectors to guarantee the correct functioning of the burners.

Also the starting on electrodes were adjusted, as well as the combustion head and the deflecting sheet billet for the regulation of the speed of the flame.

The functioning of the servomotor for the clack valve of air of the burner was checked, together with all the existing safety devices of these burners.

10. Gasoil pumping group

The functioning of the gasoil pumping group was checked together with all the elements that make up the circuit: filters, closing valves, pressure regulating valve, connection to tank, etc...

Also all the joints between pipes, small whips, etc... were checked throughout all the circuit in order to see that there were no gasoil leaks.

11. Air distribution inside the oven

Once the ventilators of the installation were running, all pressures, depressions and flows in the impulsion nozzles and air aspiration valves in the interior of the whole oven were checked, obtaining general values for:

Pressures	:	+ 12	m.c.a.
Depressions	:	- 30	m.c.a.
Flows	:	26.000	Nm ³ /h

12. Bundle turners

The right functioning of this machine was tested by carrying out the corresponding manoeuvres of fastening, turning and unturning, and placing correctly the necessary stopping and safety devices.

B.- HEATING TESTS IN OVEN

1. Burners and temperature regulators

Once the correct functioning of all the fans, motors, safety devices, etc... described in the previous paragraphs was checked, the technicians proceeded to turning the burners on.

The technicians also checked the adjustment of the air clack valve for the functioning of the burners with one or two flames, seeing that it was correct and seeing that all the changes happened smoothly and without vibrations. Also, it was checked that the size and colour of the flame was the appropriate one.

Also the draught of the combustion chamber was adjusted, checking the colour of the fumes at the exit of the chimney; adjusting it, in one word, to achieve a good combustion.

Finally the correct functioning of all the safety devices and temperature alarms was checked by means of the regulators used for that purpose.

2. Temperature curve

Once the configuration of the temperature regulators was adjusted according to the required P.I.D. regulation, depending on the types of thermocouples used, temperature ranges, control relays, alarms, etc..., and after having stabilized the oven at testing temperature, the technicians proceeded to recording the temperature curve, obtaining the graphic desired according to the speed of the line and time spent by the sheet, with the varnish on, in temperature. That is to say, 10.5 minutes working at 4.000 sheets/hour. Uniformity +/- 30C in sheet.

3. Consumption of motors

We will show a drawing of the values of nominal intensity and consumption intensity of the different motors of the installation:

	Nominal Inten.	Consumed In.	
Aspiration at entrance hood		3.7	2.4
Solvent aspiration		5.2	2.8
Exit hood aspiration		1.95	0.8
Recirculation fan, 1 st zone		29	12-21
Renewal air, 1 st zone		1.95	0.8
Fume aspiration, 1 st zone	2.55	2.5	
Recirculation fan, 2 nd zone		29	12-21
Renewal air, 2 nd zone		1.95	0.7
Fume aspiration, 2 nd zone	2.55	2.5	
Cooling fans		4	2.5 (*4)

C.- TESTS OF FEEDING AND UNLOADING OF SHEETS

Once the sheet size to be used in the work process was defined, the technicians proceeded to adjusting the following elements: side guides and ends of the feeder; pushers, centring devices, side guides and front ends of the introductory table of the coater; side guides of the intermediate table, sheet centring devices of the entrance and exit tables, side guides of the stacker.

Tinplate sheets were loaded in the machine and they were posteriorly unloaded until achieving a perfect feeding and stacking of sheets.

D.- TESTS OF VARNISH APPLICATION

1. Adjustment of the machine for work

Varnish was fed into the machine after having placed the following accessories: trays, rubber pipes, and tanks. This was done to complete the varnish circuit until achieving, by means of different adjustments, the most appropriate thickness of the varnish layer in each application.

Once this was done, some tinplate sheets were sent through until achieving the desired application.

Afterwards, and with the oven stabilized in temperature, the technicians proceeded to passing coated sheets through the oven to check that the drying and cooling process were correct.

2. Tests with different types of varnish and tinplate.

Results

In order to compare the different types of varnish, we used three different types:

- PRISMA Varnish, Spanish.
 - Sanitary
 - Sanitary, deep drawing
 - Aluminium, deep drawing

- French varnish
- Vietnamese varnish

We carried out the same comparative process we two different kinds of tinplate:

- Russian tinplate
- Japanese tinplate

Depending on the viscosity characteristics, drying time in temperature and thickness of wet layer given by the varnish suppliers, tests were carried out with different brands, checking the adherence, hardness of the layer, weight of dry layer and degree of polymerization. We noticed there was a clear difference between the various varnish types used, and the following conclusions were reached:

PRISMA Sanitary varnish:

- Very good adherence
- Hardness beyond the minimum foreseen by the manufacturer.
- Polymerization: beyond the minimum foreseen by the manufacturer.
- Deep drawing: tests on production press were carried out with very good results
- Dry layer: correct weight following the percentage given by the manufacturer.

Tests were carried out in all different points of the sheet, to check the uniformity of the results.

E.- FINAL TEST OF THE INSTALLATION

Once all the previously described tests were finished, the final test of the complete line was carried out.

In order to carry this testing out, the PRISMA varnish was used, together with Japanese tinplate of 720*520 mm, 0.24 thickness. The production speed was 4.000 s.p.h. and the oven temperature was 200°C.

Sheets were being fed into the oven during a period of 3 hours, obtaining 9.820 sheets at the other end of the oven.

The electrical consumption was 75% of the installed power.

The gasoil consumption at full production was 52 litres/hour.

In these conditions, the general production will be inferior to the foreseen production, but the reader has to bear in mind that the sheet used is a small one.

F.- FINAL SECTION

As a conclusion, we want to make the following considerations in this chapter:

- a) The high technical level of the personnel of VEGETEXCO, who helped in the assembling of the installation, made it possible for this assembling process to be fulfilled in a "record" time.
- b) The quality of the assembling can be defined according to the opinion of the assembling chief of INGHOR, who says that the guides of the oven conveyor have been aligned by the personnel of VEGETEXCO, and this is something that had not been done up to that date.
- c) The partial starting on of the equipment that makes up the installation was also carried out by the personnel of VEGETEXCO, in a 90%, with the final supervision of our Engineer.
- d) The factory is a very good one regarding ventilation, quality of the floor (which is very good for cleanliness), sizes, etc...
- e) Lacking installation for air-conditioning system, the laboratory meets all necessary qualities to fulfil its purpose.
- f) The quality control tests have been carried out by the personal of VEGETEXCO, who now know this subject in depth thanks to the knowledge they acquired in the training process carried out in Bilbao.
- g) The only black point of all this installation is the problems with the electrical supply, caused by serious shortages existing in the electrical installations of Ho Chi Minh City.

The failures in the electrical supply happen often and the voltage is variable.

In this sense, VEGETEXCO has done every possible effort to overcome this deficiency.

This is a problem that must be solved with the company supplying electricity to that area, as it may cause serious harm to the equipment.

- h) Another very important point, which has to be kept in mind, is the quality and size of the tinplate. The quality of the tinplate is very irregular: with a certain type of material the optimum production could be obtained, while another type was so poor that only a 20% or 30% good performance could be obtained. Of course, VEGETEXCO has understood this and they will do every possible effort to avoid these differences.

The size of the tinplate sheet is also important. The testings have been carried out with the minimum sizes allowed by the machine. If a medium size sheet was used, the production would be doubled, which would mean a sensible saving in the costs.

When the transformation equipment for manufacturing cans is bought, it is very important to acquire also machinery for big tinplate sizes, as it is usually the cutting press what limits the sheet size.

- i) The starting on of this installation has been one of the most comfortable and fast ones INGHOR has ever done. This has been so thanks to the will and work of the personnel of VEGETEXCO, and thanks to the deep knowledge they have.

We have noticed all this during the starting on and during the work days after the starting on. They have been able to work on their own from the very first moment in the manufacturing line, in every matter regarding varnish and in the quality control procedures.

The varnish application technic and its production processes are as complex as many other processes, and experience is, no doubt, very important. I think that in spite of lacking experience (which only time gives), the technicians of VEGETEXCO have deep knowledge on the equipment and the varnish application technic, deeper than the general knowledge of some other customers we have met. Therefore I think all this knowledge will help them overcome all difficulties arising in this type of installation.