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CANNING AND QUALITY CONTROL OF MARINE PRODUCTS

DP/VIE/87/002

VIET NAM

Terminal report*

Experts' services on establishment of experimental pilot fish canning plant and quality control laboratory (compiled in parts I to V)

Prepared for the Government of Viet Nam
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of Ole Kirkegaard, CTA and senior fish processing expert, Iwao Mizuishi and Bent Andreasen, experts for fish testing and quality control and Damrong Sirakovit, Parichet Prakarnkamanant and Somkiat Tavornpanich, trainers in fish processing and quality control

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Vienna

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* This document has not been edited.

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Parichet Prakarnkamanant, Fish quality control expert (trainer)
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Somkiat Tavornpanich, Fish processing expert (trainer)
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Damrong Sirakovit, Fish quality control expert (trainer)
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# I. PART I - THE PROJECT

## 1. BRIEF DESCRIPTION

The ultimate purpose of the project is to enable a core of national managers and engineers to master the process technology and quality control technique for the production of canned seafood, and to test the market acceptability of these products The project will establish a pilot canning module along with a quality control laboratory.

## 2. PROJECT BACKGROUND INFORMATION - DESCRIPTION OF SUBSECTOR

Resources and outputs

According to a UNIDO industry sector survey report (March 1989) the waters of the 3,260 km coastlines of Viet Nam are very rich in marine fauna: Some 1,700 species of fish (of which 110 species are now being commercially exploited), 2,500 species of molluscs, 1,600 species of crustaceans and 600 species of seaweed have been identified. Coastline cultivation of seafood and fresh water fishing and fish farming are other important resources.

Also the National Institute of Marine Products Research reports that the total fish resources within the areas accessible to the current Vietnamese fishing fleet (i.e. from coastline to 100 m depth) are estimated at about 3 million tons/year, with harvesting potential of about 1.3 million tons annually.

Annual outputs of fishery
(in metric tons)

| Year | Total | Seawater | Freshwater |
|---|---|---|---|
| 1975 | 880,000 | 670,000 | 210,000 |
| 1976 | 1,000,000 | 700,000 | 300,000 |
| .... | | | |
| .... | | | |
| .... | | | |
| 1980 | 550,000 | 390,000 | 160,000 |
| 1981 | 600,000 | 420,000 | 180,000 |
| 1982 | 664,000 | 476,000 | 188,000 |
| 1983 | 724,000 | 520,000 | 204,000 |
| 1984 | 761,000 | 531,000 | 230,000 |
| 1985 | 790,000 | 550,000 | 240,000 |
| 1986 | 825,000 | 582,000 | 243,000 |
| 1987 | 876,000 | 625,000 | 251,000 |
| 1988 | 908,000(*) | 638,000 | 270,000 |
| 1990 | 1,000,000(**) | 700,000 | 300,000 |

(*) Estimates
(**) Planned target

Source: Ministry of Fishery

Fish preservation and processing industries

Fishing output reached a peak of about 1 million tons in 1976 (approx. 70% from sea and 30% from fresh waters). Immediately after the war the strict application of relying upon state and cooperative enterprises was seen as one of the main causes of the 45% drop of fishing outputs between 1976 and 1980. Individual fishermen were then reduced to subsistence occupation. This policy was reoriented in 1981 to let state and cooperative enterprises buy from the latter, process and market fishery products, including export. This led to the steady increase of the annual catches. As an indication, in 1986 and 1987 catches by state and provincial fishing enterprises amounted to no more than 7-8% of the total annual outputs, and the remaining 92-93% were landed by cooperatives and private sector fishermen.

Viet Nam has no fish/marine products processing/canning industries. There are 97 plants belonging to 82 state enterprises and provincial cooperatives. 44 of these plants have processing capacities (preservation of fishery products in dry, iced and frozen form and packages for export and large-scale in-country commercialization). The remaining 53 plants produce fish sauce mostly for local consumption. 65 of these plants and some major fishery cooperatives are grouped together into the Union of Vietnam Fishery Producers and Import-Export Corporation (SEAPRODEX), essentially for import and export trading purposes.

Export earnings derived from sea products

In this decade of the 1980s export of sea products, solely in dry and frozen form, increased steadily. Main import countries todate are Japan, Hong Kong and Singapore. Earning jumped from US$ 19.5 million in 1981 to US$ 140 million in 1987. This is also an important item among the export products since its share in the total earnings increased from 11 to more than 15%.

Share of marine products export
as compared to total export

| Year | Total export | | Marine products export | |
|---|---|---|---|---|
| | US$ (million)* | % | US$ (million) | % |
| 1983 | 588 | 100 | 65 | 11 |
| 1984 | 665 | 100 | 83 | 12.5 |
| 1985 | 746 | 100 | 90 | 12.1 |
| 1986 | 785 | 100 | 105 | 12.4 |
| 1987 | 880 | 100 | 140 | 15.9 |
| 1988 | 1.070 | 100 | 165 | 15.5 |

Source: * Far Eastern Economic Review, 27/4/89

Employment impact of the subsector

Some 214,000 people are directly engaged in these activities. While fishing boats are exclusively manned by male population, a significant proportion of women are employed in the handling and commercialization of the catches. Fish processing (production of fish sauce) and preservation (freeze packaging and drying) industries employ about 30,000 people (80-85% women).

Other export statistics

| Year | total annual catch from sea (tonnes) | Tonnes | Export % of total | Value (US$) |
|---|---|---|---|---|
| 1981 | 420,000 | 3,500 | 0.8 | 19,500,000 |
| 1982 | 476,000 | 9,000 | 1.9 | 55,000,000 |
| 1983 | 520,000 | 13,000 | ?.5 | 65,000,000 |
| 1984 | 531,000 | 15,000 | 2.8 | 83,000,000 |
| 1985 | 550,000 | 17,000 | 3.1 | 90,000,000 |
| 1986 | 582,000 | 18,000 | 3.1 | 105,000,000 |
| 1987 | 625,000 | 30,000 | 4.8 | 140,000,000 |
| 1988 | 638,000 | 35,000*) | 5.5 | 165,000,000*) |

*) Estimates.

## 3. DEVELOPMENT OBJECTIVE

To establish fishery products processing industries to meet the requirements of home consumption and rapidly increase the volume of export goods. The development objective of this project falls along with this policy statement.

## 4. IMMEDIATE OBJECTIVES AND OUTPUTS

Immediate objective 1

To establish a pilot base to effectively absorb the transfer of processing technology, and to test export marketing of canned marine products.

Output 1

An experimental plant module capable of developing recipes and producing commercial samples of canned marine products with flexible process vessels. and a canning line of maximum design capacity of 60 cans/minute. Maximum working capacity: 24,000 cans/day of 185 gr. each (Diam. 87 mm, height 40-116 mm).

Output 2

Recipes of 10 to 15 products of canned seafood tested in local and export markets. Priority items will include clams, shrimps, scallops, crab meat, swallow nest soup, shark fin soup, fish bladder soup.

Immediate objective 2

To establish a model quality control system for commercial handling and/or processing of fishery products.

Output 3

A demonstration quality control section established at SEAPRODEX Plant No.2.

**PART II** **STATUS REPORTS** by Ole Kirkegaard, Chief Technical Adviser (Senior Fish Processing Expert) - DP/VIE/87/002/11-01/J 13103

A. 1st split mission - 0.7 man-months (3 weeks) 2 - 22 February 1990

## 1 PRESENT SITUATION AT THE PROJECT SITE - SEAPRODEX PLANT NO.2

The new building for processing of dried squids is nearly finished and within one month the space for the canning line will be available. Behind the building a new road is under construction, then access to the new production site will become easier. At the cold store one of the chambers is going to be rebuilt into a chilled room where the fish raw material is being kept.

The laboratory is at present equipped with some basic equipment but it is lent from another company and has to be returned as soon as the project equipment arrives. Some of the tables in the laboratory (made of painted iron and covered with tiles) have to be exchanged against new stainless steel tables.

SEAPRODEX Plant No.2 is in urgent need of improvement, the project implementation has to advance as quickly as possible. The delay of the project by one year has resulted in an increase of the equipment price by about 8-10%.

## 2. RAW MATERIAL SUPPLY SITUATION

Together with the NPD Mr. Kirkegaard and Mr. Mizuishi inspected one of the shrimp farms and some landing places to get a general impression of the quality of fish to be processed.

There have been no changes at the landing places since the backstopping officer's and Mr. Kirkegaard's visit in 1988. There are still no ice plants, no proper landing facilities for the fishing boats, no cold storage rooms for the fresh fish. The fishing vessels dispose of only a small number of plastic bins and there is too little ice available to preserve the freshness of the fish. The raw material processed at the pilot plant has to be of good quality, there is no possibility to process bad raw material into high quality products.

The shrimps from the farm are directly being iced after the harvest, however, not fast enough to avoid that they get some black spots on the shell; then they are transported in wooden baskets and not in plastic bins with cold brine, which also leads to a loss in quality.

## 3. HOW TO INCREASE THE QUALITY OF THE RAW MATERIAL

The landing places have to be rebuilt, i.e. some of the small landing places have to be relocated to bigger harbours and all necessary facilities such as is making plants, chilled auction rooms, workshops and refuelling points have to be established.

When these measures have been taken the vessels can be properly filled with ice before leaving, so the catch can be cooled immediately and stored in plastic bins, or is dumped into tanks with ice water so that the fish is killed immediately and within a short time the center temperature of the fish reaches 0-5 °C. That way the fish is not under pressure. This results in a good structure inside the fish. the fish is landed in bins which are taken directly to the chill room waiting for collection by the company's refrigerator trucks. Immediately after the harvest the shrimps should be put into insulated tanks filled with water, ice and about 1% of salt. They should be transported to the factories in these tanks.

If these improvements are carried out raw material of high quality can be processed into products of high value.

## 4. STATUS OF THE PROJECT - SITUATION AT THE PROJECT SITE

Upon signature of the contract on 30 November 89 project implementation started. It began with the first mission of Mr. Mizuishi from 5 to 25 January 1990 who was in charge of the quality control of fish and fish products. Mr. Kirkegaard was appointed as project CTA, whose duties were the establishment of the canning line; his first mission was from 2 to 22 January 1990.

Upon inspection of the project site and building where the laboratory was to be accommodated Mr. Mizuishi and Mr. Kirkegaard discussed with the staff of SEAPRODEX what had still to be done before equipment arrival.

The present situation is such that the offices for the CTA and QCE are about to be finished and within a month all the furniture including office equipment (computer) will be installed. SEAPRODEX is providing transport for the project staff.

Generally it must be said that SEAPRODEX has so far been very engaged in the preparatory work for the project and the hall/rooms will be equipped in accordance with the experts' drawings. There is no doubt that from SEAPRODEX' side all the preparatory work will be completed before equipment arrival.

## 5. ACTIONS TO BE TAKEN BY SEAPRODEX BEFORE DELIVERY OF THE CANNING LINE

The production buildings are in such a condition that certain repairs have to take place before the equipment arrives: New drains have to be installed in the production area, the existing drains do not have enough capacity and are placed in the middle of the hall. However, the drains have all to be placed all over the production area as given in the drawing; in the area for packaging materials and finished products only two drains are required, unless this area is used for future production lines.

The floor has to have a smooth and even surface, easy to clean. In the production area sinks have to be installed, with knife sterilizers and soap dispensers at the walls. The walls in the production area have to be covered with tiles up to a height of 1.8 m. The roof has to be lowered to a height of 4 m, the surface has to be smooth. The CTA's suggestion is that the walls and roof are made of 100 mm thick insulation panels, with the white side facing the production area, covered with PVC/Epoxy. In this case there will be no need for tiles at the walls.

The production area has to be equipped with a cooling system, where the temperature can be kept at 18° C. The best solution will be a system called "air sock cooling", this sytem is working that way that the cold air is not blown directly at the workers but falls down gently from the roof.

The existing area for sterile packaging has to be rebuilt into 3 sections, one to be used as office for the production assistant, one as mixing room and one as rest room for the workers. The cooking area has to be separated from the production area and equipped with a good ventilation system to draw off the steam from the cooking vessels.

The production area is to be entered through two doors, one sliding door and one normal door to be used as laborers' entrance. The doors have to fit 100% into the walls. Solid windows have to be installed to secure protection against insects in the production area. Running water has to be available in the production area. An air compressor has to be installed, with a pressure of 8 bar and fitted with a 10 HP motor. All this work has to be carried out before October 1990, at which time the equipment is scheduled to arrive at Factory No. 2

## 6. UNIDO/UNDP INPUT

In accordance with the contract, UNIDO/UNDP have to deliver equipment for production and laboratory. Furthermore, one Processing Expert (15 m/m) and one Quality Control Expert (6 m/m) are to be recruited.

UNIDO/UNDP are to organize a study tour for members of the Government and people from SEAPRODEX Plant No.2 in Ho Chi Minh City as well as fellowship training for 10 people in quality control and modern production.

## 7. DEVELOPMENT OF NEW PRODUCTS

After having investigated the different types of fish available in the waters around South Viet Nam it has been decided that the target for the canning development line will be the production of the following products:

Shrimps
Crabs
Tuna
Mackerel
Clams
Squids
Shark fin soup
Other types of fish soup.

Before the start-up of the canning line some products have to be developed at the laboratory. This work can be carried out during the erection of the canning line. This way the project will not be disrupted. The products developed in the laboratory have to be tested and if found satisfactory some test samples will be tested by a panel of independent scientists. When the panel has selected the right product 2.000 cans will be sent to SEAPRODEX' customers for examination and after a positive result from the customers the production can start.

## 8. TESTS FOR QUALITY ASSESSMENT OF SEAFOOD

Seafood usually changes soon after harvest, resulting in a loss in quality and commercial value. Fish is rotting principally for two reasons:

Self digestion

Breakdown of the meat of the marine animal fish by self-digestion is encouraged by the presence of enzymes in the living animal, these enzymes remain active after the death of the animal.

Action of bacteria

Bacteria are present in the intestines and skin of the fish. As long as the animal is alive most of the bacteria are not harmful and may even be beneficial. When the animal dies, however, they increase in number and invade the fish meat, breaking down the complex chemical substance of the meat, producing an increasing amount of ammonia and putrid and inedible fish .

Laboratory tests for quality assessment of seafood are numerous and may be categorized as mandatory or voluntary. Many countries have legal requirements for quality indices, including defined analytical methods that the industry must comply with. However, other indices, not included in the legal requirements, are also used in quality assessment. The methods for quality assessment can generally be categorized as:

(a) Physical and sensory
(b) Microbiological
(c) Chemical.

None of these methods can satisfactorily serve as quality test. Normally data from all three categories are used in assessing the quality of fish products.

(a) Physical and sensory tests

This method is essentially used for determining the commercial value of the seafood products. Soon after the death fish changes in colour, texture and smell. Furthermore, careless handling causes bruising and physical damage. If the result of physical and sensory tests is low the commercial value of the seafood products is almost nil even though microbiological and chemical tests are showing a good result.

Numerous testing schemes for physical and sensory tests have been developed by the consumer markets. These are specific to the fish species, to the packaging form and to the consumer markets. It is, therefore, necessary to have specifications made for each product, each packaging form and each consumer market.

No special equipment is needed for physical and sensory evaluation since the technologist (experienced worker) uses his five senses to arrive at conclusions. However, sampling techniques and statistical procedures based on mathematical models are adapted to minimize errors.

b) Microbiological tests

Generally in healthy fish the meat is sterile. After the catch fish is contaminated by bacteria at different stages before reaching the consumer, i.e. it depends on how it is handled on board of the fishing vessel, at the landing place, at the plant, during processing, etc.

The primary concern of bacteria is focused on two broad groups, namely pathogens, i.e. bacteria that can cause human diseases, and putrefactive bacteria that cause spoilage of the fish meat.

There are well established international standards such as those from the Codex Alimentarius Commission. Many countries have their own standards, usually focussing on indicative bacteria which infer that the fish was caught in polluted waters or contaminated during handling and processing.

Bacteria species differ widely in their characteristics and bacteriologists have developed many procedures to identify and enumerate them. A modern equipped laboratory is required for such tests. Recently, a bacteria testing paper has been developed and introduced in the market. It is used for different species, such as Aerobic plate count, colliforms, E.Coli and Staphylococcus aureus etc.This testing paper e.g. is showing red or pink colour with spotted colony of the bacteria if the samples are contaminated. The table underneath is showing US FDA standards for seafood:

| Test | Limit per gram |
|---|---|
| Aerobic plate count/gr. (35° C) | $5.0 \times 10^6$ |
| Coliforms/gr. | 500 |
| E.Coli/gr | 23 |
| Staphylococcus aureus/gr. | 500 |
| Salmonella | negative |

Bacteria grow faster at high temperatures.

| | | | | | |
|---|---|---|---|---|---|
| Temp.(° C) | 1 | 5 | 10 | 16 | 27 |
| Growth cycle (hour) | 24 | 12 | 3 | 2 | 1/2 |

Thousand bacteria per gram.

| | | | | | |
|---|---|---|---|---|---|
| Initial | 10 | 10 | 10 | 10 | 10 |
| 12 hour storage | 14 | 20 | 160 | 640 | 163 billions |
| 18 hour storage | 17 | 30 | 640 | 5120 | |
| 24 hour storage | 20 | 40 | 2560 | 20450 | |

Both enzymatic and bacterial action can be reduced by lowering the temperature.

## Microorganisms

Microorganisms responsible for spoilage of foodstuffs cease to grow and in some cases die off slowly at low temperatures. The acceptable level of temperature below which microbial growth may be disregarded is - 10° C to - 12° C.

## Biochemical agents (enzymes)

Biochemical agents may be inhibited by freezing but some will remain active at very low temperatures.

(c) Chemical tests

When fish dies internal enzyme systems in the fish substance begin their autolytic or self-digestion process which affects the proteins and liquids and the freshness begins to diminish. Chemical indices are used to measure components involved in these breakdown processes. The advantages of chemical indices compared to physical and sensory tests are that they are objective, and laboratory procedures can be standardized. Chemical indices are consistent with relation to enzymes, bacteria activity and liquid quality.

Enzyme-related indices

During the autolysis certain complex compounds are broken down into simpler compounds. By measuring the quantities of these compounds it is possible to quantify the decrease in the freshness of the fish.

A. Hypoxanthine (Hx)

Immediately after the fish dies adenosine triphosphates (AIP) break down into several intermediate compounds, excluding Hypoxanthine (Hx). The accumulation of Hypoxanthine (Hx) reflects the initial phase of Autolysis. There are several methods of measuring Hypoxanthine (Hx).

In the enzyme methods Xanthine Oxidace converts Hypoxanthine to Xanthine (X), and then to Uric Acid (U). The Hypoxanthine can be quantified by SPECTROPHOTO METRY.

For this test a blender, pH meter, water bath and spectrometer are required. Modifications of the enzyme methods include test paper strips containing redox indicator dye and an enzyme sensor system.

Hypoxanthine can also be measured by thin layer chromatography (TLC), ion-exchange columns or by high pressure liquid chromatography (HPLC). The apparatus for the TLC and ion-exchange procedures are relatively simple while the HPLC is a sophisticated instrument.

The Hypoxanthine test could be applicable to most species of fish. However, the actual level of Hypoxanthine has been found to be dependent on species, seasonal differences and environmental conditions. As such, the measurements of Hypoxanthine should preferably be combined with another chemical parameter, e.g. Trimethylamine (TMA).

B. K-Value

The K-Value measures the total content of Adenosine triphosphate (ATP) and its breakdown products are expressed as a percentage of Inosine (HxR) and Hypoxanthine of the total acid soluble Nucleotides, which are presented as turning point between freshness and spoilage.

In recent years a new freshness meter indicating the K-Value has been developed and is on the market. This instrument consists of a water bath incubation chamber fitted with an oxygen electrode, a digital display and a chart recorder.

Enzyme mixtures are used to reduce the time and the amcient of oxygen consumed is measured. The K-Value results obtained by this instrument are closely comparable to those by the ion-exchange methods and easy to measure.

Another enzymatic method is the K-Value paper. It uses an enzyme-treated paper containing dyes and a colour chart to determine the K-Value. The results are less accurate than the before-mentioned instrument and the ion-exchange method but it is useful in the field, i.e. for checking of the raw material at the landing place and in the plant.

The ion-exchange column can also be used to measure the K-Value. The Inosine and Hypoxanthine in a fish meat extract are separated from the other components of Adenosine Trophosphate degradation. A spectrophotometer is used to quantify the components and the K-Value is computed. A peristaltic pump and a chart recorder are optional instruments.

$$\text{K-Value} = \frac{Kx - HR}{ATP - ADP - AMP - IMP - HxR - Hx}$$

| | | |
|---|---|---|
| Hx | : | Phpoxianthine |
| HxR | : | Inosine |
| ATP | : | Adenosine Triphosphate |
| ADP | : | Adensine Diphosphate |
| AMP | : | Acid Adenosine |
| IMP | : | Acid Inosine. |

Bacteria activity related indices.

Immediately after the fish dies bacteria begin to spoil the meat. The breakdown complex of substance into simpler compounds is used to presume the degree of spoilage by bacteria.

C. <u>Total volatile bases (TVB)</u>

The microdiffusion technique uses a circular glass dish with an inner and an outer ring ditch (conway). An acid extract of fish meat is to be placed in the outer ring. After incubation the acid/dye solution is titrated, using a microrobinette. The TVB is computed as the total nigrogen (TVB-N).

The same principle of putting amino compounds into boric acid solution and titration with a standardized Hcl is used in variations of the microdiffusion method, such as atmospheric distillation, vacuum distillation and aeration.

As the total volatile base is composed of numerous basic compounds of varying concentrations its correlation to oreganoleptic quality is not specific. It correlates well with some species of fish but not with others.

D. <u>Trimethylamine</u>

Trimethylamine oxide (TMAO) is found naturally in most marine fish. Bacteria enzymes reduce a significant portion of the Trimethylamine oxide (TMAO) into Trimethylamine (TMA), a compound which contributes to fish odours.

In the picric acid method an acid extract of fish meat is reacted with picric acid to produce a highly coloured pectrate. A spectrophotometer is to be used to compute the amount of trimethylamine (TMA) present. For this method other equipment, such as a centrifuge tissue blender and a voitex mixer etc. is required. The trimethylamine can also be measured by the microdiffusion method as well as by automated methods, especially high pressure liquid cromatography (HPLC) which are increasingly being used.

The initial level of trimethylamine oxide (TMAO) and the rate of trimethylamine formation vary with different species and sometimes within the same species according to size and harvest places, making it difficult to correlate trimethylamine to oreganoleptic quality. Fish stored in frozen condition, the trimethylamine and the dimethylamine (DMA) should be measured simultaneously to obtain a more accurate measure of trimethylamine.

E. Dimethylamine (DMA) and formaldehyde:

Trimethylamine oxide (TMAO) can also be broken by enzymes into equal amounts of dimethylamine and formaldehyde (FA), hence measuring one of them can be used to quantify the other. Dimethylamine and formaldehyde cause loss of extractable myofibrillar proteins, loss of water holding capacity and an overall decrease in cooked acceptability of the meat.

Dimenthylamine is usually measured by the modified dyer's method. An acid muscle extract is reacted with copper ammonium reagent and carbon disulphate to produce a yellow coloured copper compound which is quantified by the spectrophotometer. The apparata required are a voitex mixer, water bath blender, low speed centrifuge and spectrophotometer.

Formaldehyde is commonly determined by using the "Nash" reagent. Free formaldehyde in an acid extract of fish meat is reacted under neutral pH with the "Nash" reagent, containing ammonium salt. The yellow coloured complex formed is measured by the spectrophotometer.

F. Liquid-related quality indices

During the storage of fish in frozen form liquids are undergoing hydrolysis and oxidation. The accumulation of oxidation by-products is responsible for the change in quality of the flavour, evident in low quality frozen fish.

In the analysis of liquid indices first the liquid must be extracted from the fish material, i.e. an organic solvent is to be used to dissolve the liquid and then subsequently extract it concentrated for further tests.

G. Acid value and free fatly acid

The acid value (AV) is defined as the number of milligrams of potassium hydroxide (KOH) required to naturalize the free fatly acid (FFA) in 1.0 g of fat or oil. The acid value (AV) gives the extent to which the glycerides have been hydrolyzed. As oil rancidity is usually accompanied by free fatly acid formation, its measure gives an indication of the quality of the oil.

In measuring the acid value the fat in a neutral solvent is titraded with a standard potassium hydroxide (KOH) solution. The acid value is computed by the amount of potassium hydroxide used. The free fatly acid figure is calculated as oreic acid and is obtained by dividing the acid value by two. This process requires only standard laboratory glassware.

H. Peroxide value

Peroxides are formed at the early stage of liquid oxidation. As oxidation proceeds peroxides break down further to aldehydes or combine with proteins.

Most measures developed to measure peroxides are based on the measurement of iodide by the peroxides. The apparata required are an aerotary evaporator and a vacuum pump system with stopwatch and the standard laboratory glassware.

I. Di-triobarbituric acid

The amount of malonaldehyde formed during liquid oxidation is indicative of the stage of oxidation. Malonaldehyde in the liquid is released by gently heating with a mild acid and reacts with 2-triobarbituric acid (TBA). The coloured complex formed is measured with the spectrophotometer.

The apparata required are a spectrophotometer, a blender, a water bath, a rotary evaporator, a vacuum pump, a centrifuge and a Voitex mixer.

The triobarbituric acid (TBA) test correlates well with the development of off-odours and flavours. However, some precaution must be taken in interpreting the results.

The TBA results are influenced by the nature of the unsaturated fatly acid. And there are also numerous other compounds which interfere with TBA, either by producing other TBA complexes or by reacting with the malonaldehyde itself.

This method requires a good experience in the laboratory work.

J. Carbonyl Value (COV)

During liquid oxidation, especially at an advanced stage, secondary products containing carbonyls are formed. The carbonyl value (COV) measures these products. Red coloured hydrozones are produced by condensation of the carbonyl group with 2.4 - dinitrophenyl hydrazine.

This analysis requires very clean reagents and solvents.

The apparata required are a water bath, a spectrophotometer and the standard laboratory glassware.

## 9. DESCRIPTION OF THE CANNING LINE

The area for the pilot canning line is divided into two parts, the production hall and the storage room for empty and full cans; in this room there is also space for filling of empty cans and labelling.

The empty cans are placed on the infeed table and automatically transported to a rotary filling machine, where they are filled with shrimps, clams and crabs in case these are available. If not the cans pass through and get to the cleaning and packing table. The rotary filler is designed that way, that only if there are cans available it automatically fills products. The volume can be adjusted by lowering or raising of the rotary plate.

At the cleaning and packing table the cans are automatically fed to the table by a conveyor and when they are filled up a finger goes down and stops the cans. At the same time they move a little backward and stand loose on the belt, the belt stops automatically and after a while it starts again. The laborers standing at the tables clean the products and fill them into the cans, they put the filled cans on the coveyor belt next to the feeding belt for empty cans. Under the belts for empty and filled cans a conveyor (to transport the offal to a trolley) is placed. The offal gets to the conveyor by outlets in the cleaning tables.

After the cans have been filled they are coming to a checkweigher, where they are automatically weighed. If the weight is correct the cans proceed further, if not the cans are sorted out and put on a small table for refilling.

The cans are now passing through a brine filler, where they are automatically filled by the overflow system. Then they come to the automatic seamer, which has an automatic lid dispenser. When the lids are dispensed they are coded at the same time. The seamer is a one-head-seamer, i.e. the capacity is approx. 60 cans/min.

After the cans are seamed they pass through a washing machine with two chambers, in the first chamber they are washed with a detergent, and in the second they are washed with pure water. Then the cans fall down into the retort baskets which are placed in a vessel with cold water.

When the retort baskets are filled up they are taken to the retort and when the retort is filled it is closed and the cooking time, temperature and pressure is coded in, the whole cooking process is running automatically.

After retorting the cans are emptied on a feeding table for the labelling machine. The labeller puts the label automatically on the can with a combined hot melt/cold glue mixture. Now the cans enter the packing table where laborers fill the cans into cartons. When a carton is full it is pushed through an automatic tape machine which tapes top and bottom. Now the products are ready for storage.

In the processing area there are cooking and cooling vessels for pre-cooking of products such as mackerel and tuna, etc. and there are cooking vessels complete with pumps connected to the filler to produce soups. In this room there is the complete brine/tomato mixing unit with pumps connected to the brine filling unit. At the gutting table the fish is cleaned and gutted before it is put on trays for pre-cooking.

## 10. STUDY TOUR

It was agreed with the NPD that 5 people will participate in the first study tour and 3 in the second instead of 4 as agreed with UNIDO Vienna. During the CTA's visit to UNIDO HQs it was agreed upon with the backstopping officer that 5 people participate in the first study tour instead of 4. It was the wish of the Vietnamese to go to Vienna first and then proceed to Denmark but instead Mr. Galat will go to Denmark to join the group there for some days.

The tour to Denmark will be arranged in such a way that the group will go to the North Sea Center and there have lessons in fish handling, processing, development of new products, regulations and creation of a modern fishing harbour with all facilities. At the same time the group will be visiting harbours, fishing vessels, factories, ice making plants, auction halls and fish meal plants. Visits will be arranged to other processing plants, from high-tech factories to old renovated plants, and there will also be visits to manufacturers of equipment for the fish processing industry.

Following people will be in the first group:

Mr. Vo Van Trac
Vice Minister of Fishery
Director of the Viet Nam Fishery Development Programme.

Mr. Kieu Chau Hoan
Vice Director of Factory No.2 of SEAPRODEX
NPD of VIE/87/002.

Mr. Nguyen Dinh Hung
Vice Director of Factory No.2 of SEAPRODEX
NPC of VIE/87/002.

Mr. Lam Duc Dinh
Director of the Quality Control Department of SEAPRODEX
Seafood Processing Engineer.

Mr. Hoang Vinh
Interpreter and Secretary of project DP/VIE/87/002.

The CTA will take the group back to Ho Chi Minh City, take a look at the facilities and give new directions for the rehabilitation of the buildings. As agreed upon with the backstopping officer, Ramboll & Hannemann will send an offer for the study tour as soon as possible.

The first study tour will take place from 23 April to 20 May 1990, the schedule will be as follows:

| | |
|---|---|
| 23/4/90 | Departure Ho Chi Minh for Bangkok |
| 23/4/90 | Departure Bangkok for Copenhagen |
| 14/5/90 | Departure Copenhagen for Bangkok (incl. CTA) |
| 20/5/90 | Departure Bangkok for Ho Chi Minh |
| 30/5/90 | Departure Ho Chi Minh for Copenhagen (CTA only). |

## 11. FELLOWSHIP

The fellowship tour is not yet planned but it has been agreed upon that there will be a training period of 3 months and that training is required in laboratory handling, processing, maintenance and development of new products.

## 12. IMPLEMENTATION OF THE PROJECT

The implementation of the project has just started with the visit of SEAPRODEX plant no.2 and the discussion between the NPD, NPC, QC expert and the CTA.

It has been agreed upon that project implementation should be pushed in the equipment procurement stage and the suppliers should be asked to shorten delivery times. All steam-operated equipment and the boiler have to be delivered first for installation and the processing line should be delivered and installed later. This way it will be possible to accelerate project implementation by about 2 months, so that the installation and test runs can still be done this year, the production can then be started in December.

## 13. RISK IN IMPLEMENTATION

There are some risks in implementation:

- Delay in purchase
- Several suppliers
- Missing drawings for rehabilitation of drains, steam, pressure air and water pipes
- Delay in construction of buildings
- Clearing problems at the port
- No products developed in time.

If these problems are solved there should be no risk in the implementation phase and it should be possible to keep the project implementation schedule.

ANNEX I

## CANNING LINE EQUIPMENT

| Quantity | Items and specifications |
| --- | --- |
| 1 | Rotary infeed table made of stainless steel with a table top of delrin, variable gearmotor with safety device.<br>Diameter: 1,500 mm<br>Electricity: 3 x 380 V, 50 Hz |
| 1 | Empty can washer made of stainless steel with a slat band of PVC, water pump and an overflow system, equipped with a variable gearmotor.<br>Capacity: 80 cans/min.<br>Electricity: 3 x 380 V, 50 Hz |
| 1 | Rotary pocket filler made of stainless steel and with a slat band of PVC, variable gearmotor, adjustable telescope cups 125 - 500 ml and with extended infeed and outfeed conveyor.<br>Infeed conveyor: 2,000 mm<br>Outfeed conveyor: 2,500 mm<br>Capacity: 80 cans/min.<br>Electricity: 3 x 380 V, 50 Hz |
| 1 | Filetting and filling line for mackerel and tuna: double conveyor for feeding of empty cans and for transporting of the filled cans to the checkweigher; on each side of the double conveyor there are placed 4 trimming/packing tables with holders for plastic bins, under the conveyors there is a conveyor to transport the offal away and on the tables there are outlets. The feeding conveyor for empty cans is equipped with an advice to stop the cans when they are filled up.<br>Infeed conveyor: 8,000 mm<br>Outfeed conveyor: 8,500 mm<br>Tables: 2,200 x 1,000 x 850 +- 50 mm<br>Total length: 10,000 mm<br>Electricity: 3 x 380 V, 50 Hz<br>Motors: Variable |
| 1 | Checkweigher made of stainless steel and with automatic sorter for over- and underweight, panel for setting tolerance and equipped with a PVC fibre belt.<br>Weighing range: 100 - 1,000 gr.<br>Tolerance: 1 - 2 gr.<br>Electricity: 3 x 380 V, 50 Hz |
| 1 | Brine filler made of stainless steel and fitted with a brine circulation tank, equipped with adjustable pump, PVC slat band and a device to keep the product down under filling, the slat band driven by a variable motor.<br>Electricity: 3 x 380 V, 50 Hz |

| Quantity | Items and specifications |
|---|---|
| 1 | Automatic seamer made of cast iron and painted, complete with automatic lid feeding system and coding, switchboard with safety device.<br>Types for coder in 4mm.<br>3 sets from A-Z<br>6 sets from 0-9<br>Seaming range: Diam. 84, height 40 - 106 mm<br>Capacity: 60 cans/min.<br>Electricity: 3 x 380 V, 50 Hz |
| 1 | Automatic washing machine made of stainless steel with two chambers, one for washing with detergent and one for washing with plain water; the washing machine has to be fitted with recirculation tanks with filters and automatic dosing device for detergent, pumps, etc.<br>Capacity: 80 cans/min.<br>Electricity: 3 x 380 V, 50 Hz |
| 1 | Basin made of stainless steel which can accommodate two retort trolleys |
| 1 | Retort for 4 trolleys (trickling type) complete with tanks for cold and hot water, heat exchanger, recorder for time setting, pressure, temperature and actual time, pressure, temperature and complete panel for automatic operation. Fully equipped with meters and valves.<br>The retort has to be delivered with 12 trolleys.<br>Electricity: 3 x 380 V, 50 Hz |
| 1 | Automatic labelling unit, operating with a hot melting system, equipped with a control panel and safety device.<br>Capacity: 80 cans/min.<br>Electricity: 3 x 380 V, 50 Hz |
| 1 | Infeed and emptying station for cans, made of stainless steel and with a tabletop of delrin, equipped with variable gearmotor with safety device.<br>Diameter: 1,600 mm<br>Electricity: 3 x 380 V, 50 Hz |
| 1 | Roller conveyor made of stainless steel with PVC rollers.<br>Dimensions: 1,000 (l) x 600 (w) x 400 (h) mm |
| 1 | Automatic taping machine for sealing top and bottom of boxes with tape<br>Electricity: 3 x 380 V, 50 Hz |
| 1 | Roller conveyor made of stainless steel with PVC rollers.<br>Dimensions: 4,000 (l) x 600 (w) x 400 (h) mm |
| 1 | Cooking vessel made of stainless steel and heated by indirect steam, automatic temperature control, water overflow system and lid.<br>Dimensions: 2,000 (l) x 1,400 (w) x 1,600 (h) mm |

| Quantity | Items and specifications |
|---|---|
| 1 | Cooling vessel made of stainless steel with water overflow, compatible with above cooking vessel |
| 6 sets | Nets with frames for the cooking and cooling vessels made of stainless steel |
| 1 | Mixing device for brine and tomato, made of stainless steel, complete with agitator and pumps<br>Capacity: 300 lt x 2 tanks<br>Electricity: 3 x 380 V, 50 Hz |
| 2 | Cooking vessels for soups, complete with agitators and pumps, made of stainless steel and with heating jacket for indirect steam<br>Capacity: 500 lt<br>Electricity: 3 x 380 V, 50 Hz |
| 1 | Water purifier plant complete with filter and chloronation unit, pump and pressure tank<br>Capacity: 5 m3/hour<br>Electricity: 3 x 380 V, 50 Hz |
| 1 | High/low pressure cleaner with foam and heating unit, transportable<br>Electricity: 3 x 380 V, 50 Hz |
| 4 | Vemag trolleys made of stainless steel for transport of offal |
| 1 | Boiler plant complete with feeding tanks, oil tank, chimney 13 mtrs., 24 hours control panel and water softener device<br>Capacity: 1,000 kg/hour/10 bar<br>Electricity: 3 x 380 V, 50 Hz |
| 1 | Main electrical panel with relays and wires for the whole production line, all electrical items have to be telemecanique |
| 1 | Alternative for brinefiller and seamer: A combined filler and seamer can be accepted |

Delivery:

All equipment has to be delivered by one main supplier, the delivery has to be made in two shipments. First the boiler, retort and cooking vessels. The second shipment - the canning line - has to be erected at the supplier's workshop for test running before it is being shipped. The line has to be approved by one representative from UNIDO, the NPD and the CTA of the project.

Delivery dates:

Week 27: Retort, boiler plant and cooking vessels
Week 36: The production line.

ANNEX II

## LABORATORY EQUIPMENT

| Quantity | Items and specifications |
|---|---|
| 1 | Hand can tester, pressure 0 - 2 kg/cm2 |
| 1 | Vacuum can tester, vacuum 0 - 76 cm HG |
| 1 | Micrometer, 0 - 13 mm, 0.01 mm |
| 1 | Slide caliber, stainless steel 200 mm |
| 1 | Fret saw & J.G. saw |
| 1 | Seam splitting saw, 3 x 380 V, 50 Hz |
| 1 | Seam projector, 220 V, 50 Hz |
| 1 | Can opener |
| 2 | Incubators, 220 V, 50 Hz |
| 1 | F-value computer, 220 V, 50 Hz |
| 1 | Refractometer, 0 - 32% |
| 1 | Refractometer, 28 - 62% |
| 1 | Refractometer, 58 - 90% |
| 1 | Refractometer (Nacl), 0 - 10% |
| 1 | Refractometer (Nacl), 0 - 28% |
| 1 | Salinometer (digital), 0 - 9.99% |
| 1 | Ph-meter (Table) |
| 1 | Ph-meter (Portable) |
| 1 | Thermometer (Digital) |
| 1 | Moisturemeter with printer, 220 V, 50 Hz |
| 1 | Chemical balance (0.1 mg) |
| 2 | Portable scales, 3 kg |
| 1 | Magnifier (Microscope) x 20 - x 60 |
| 1 | Distilled water maker (1 1/h) |
| 2 | Distilled water receiving bottle (10 1) |
| 2 | Washing bottle, polyethylene (12 each - 250 ml, 500 ml) |
| 1 | Refrigerator (180 1) |
| | |
| 1 | <u>Fat Extraction Unit:</u> |
| 10 | Soxhletfat extraction unit, 4 sets of spares |
| 1 | Water bath |
| 20 | Boxes of cylindrical filter paper (100 per box) |
| | |
| 1 | <u>VBN Analysis Unit:</u> |
| 1 | Conway analysis set |
| 10 | Conway unit with band |
| 2 | Horizontal microburette |
| | |
| | <u>Histamin:</u> |
| 1 | Centrifuge |
| 1 | Thermostatic water bath |
| 2 | Chromatographic Column |
| 1 | Chromatography, D-2500 |
| 1 | Chromatography, L-6000 |
| 1 | Chromatography, L-4000 |
| 1 | Injector |
| 1 | Deaerator |

| Quantity | Items and specifications |
|---|---|
| 1 | Autoclave |
| 1 | Sterilizing drier |
| 2 | Incubators |
| 1 | Stomacher 400, with 1,000 bags |
| 1 | Homogenizer, with 5 cups |
| 100 | Test tubes, 15 x 150 |
| 2 | Test tube stand, 5 x 10 |
| 100 | Darhum tube, 6 x 20 |
| 50 | Glass plate, Diam. 90 mm |
| 10 | Measuring pipette, 2 ml |
| 10 | Measuring pipette, 10 ml |
| 5 | Surgical scissors |
| 5 | Surgical knife |
| 5 | Surgical pincette |
| 5 | Medical spoon |
| 5 | Measuring cylinder, 500 ml |
| 5 | Measuring cylinder, 100 ml |
| 5 | Bottom flat flash, 1000 ml |
| 5 | Bottom flat flash, 300 ml |
| 5 | Mercury thermometer, $200_o$ C |
| 5 | Mercury thermometer, $100_o$ C |
| 5 | Mercury thermometer, $50_o$ C |
| 2 | Gas burner for LPG |
| 5 | Wire net with asbest, 150 x 150 |
| 2 | Triangle stand for asbest net |
| 1 | Hand desinfection basin with stand |
| 5 | Desinfection alcohol, 500 ml |
| 1 | Sanitary cotton, 500 gr |
| 5 | Sulphurated paper, 100 sheets |
| 1 | Pincette cleaning syphone basin, PVC S |
| 1 | Pipette cleaning basin, PVC S |
| 1 | Pipette cleaning medicine |
| 2 | Hand desinfectant, Hibiden sol. 500 ml |
| 5 | Standard agar, 300 gr |
| 5 | Desoxycholate medium, 300 gr |
| 5 | E.C. mediuma, 100 gr |
| 5 | T.G.C. mediuma, 300 gr |
| 2 | Colony counter |
| 10 | Washing brush for test tube |
| 10 | Washing brush for flask |
| 2 | Pipette drying cage |
| 2 | Testtube drying cage, 20 x 20 x 20 |
| 2 | Sterilizing box for pipette |
| 1 | Balance, 200 gr |

| Quantity | Items and specifications | |
|---|---|---|
| | **For VBN:** | |
| 2 | $H_2 SO_4$ (à 50 gr) | |
| 2 | HCL (à 500 gr) | |
| 2 | NaOH (à 500 gr) | |
| 2 | $H_3 BO_3$ (à 500 gr) | |
| 2 | $K_2 CO_3$ (à 500 gr) | |
| 5 | $Na_2 CO_3$ (à 500 gr) | |
| 2 | CCI COOH (à 500 gr) | |
| 2 | Glycerine (à 500 gr) | |
| 2 | Methyl alcohol (à 500 gr) | |
| 1 | Methyl red | |
| 1 | Methyl orange | |
| 1 | Brom cresol green | |
| 1 | Tragant gum powder | |
| 1 | Vaselyne | |
| | **For Histamin:** | |
| 2 | $HCLO_4$ (500 ml) | |
| 2 | n-Hexane (500 gr) | |
| 2 | Dancyl chloride (5 gr) | |
| 2 | Aceton (500 ml) | |
| 2 | Benzen (500 ml) | |
| 2 | Acetic acid (500 ml) | |
| 10 | Acetonitril (500 ml) | |
| 10 | Methyl alcohol (500 ml) | |
| 1 | Microsyringe, ms-50 (50 ml) | |
| | **Glassware:** | |
| 5 | Beaker | 50 ml |
| 5 | " | 100 ml |
| 5 | " | 200 ml |
| 5 | " | 300 ml |
| 5 | " | 500 ml |
| 5 | " | 1000 ml |
| 5 | Flask (Erlenmeyer) | 50 ml |
| 5 | " | 100 ml |
| 5 | " | 200 ml |
| 5 | " | 300 ml |
| 5 | " | 500 ml |
| 5 | Reagent bottle with cap (white) | 30 ml |
| 5 | " | 60 ml |
| 5 | " | 120 ml |
| 5 | " | 250 ml |
| 5 | " | 500 ml |
| 5 | " | 1000 ml |
| 5 | Reagent bottle with cap (brown) | 30 ml |
| 5 | " | 60 ml |
| 5 | " | 120 ml |
| 5 | " | 250 ml |
| 5 | " | 500 ml |
| 5 | " | 1000 ml |

| Quantity | Items and specifications |
| --- | --- |
| 5 | Dropping bottle, white, 60 ml |
| 5 | Dropping bottle, brown, 60 ml |
| 5 | Funnel, diameter 60 mm |
| 5 | " 90 mm |
| 5 | " 120 mm |
| 5 | Flask, volumetric, 50 ml |
| 5 | " 100 ml |
| 5 | " 200 ml |
| 5 | " 250 ml |
| 5 | " 500 ml |
| 5 | " 1000 ml |
| 5 | Measuring pipette, 1 ml |
| 5 | " 2 ml |
| 5 | " 5 ml |
| 5 | " 10 ml |
| 5 | Hole pipette, 1 ml |
| 5 | " 2 ml |
| 5 | " 5 ml |
| 5 | " 10 ml |
| 5 | " 20 ml |
| 5 | Measuring cylinder, 10 ml |
| 5 | " 50 ml |
| 5 | " 100 ml |
| 5 | " 200 ml |
| 5 | " 500 ml |
| 5 | " 1000 ml |
| 5 | Measuring komagome with spout, 1 ml |
| 5 | " 2 ml |
| 5 | " 3 ml |
| 5 | " 5 ml |
| 5 | " 10 ml |
| 200 | Test tupe, diameter 15 x 150 |
| 5 | Evaporating dish, diameter 60 |
| 5 | " 80 |
| 5 | " 100 |
| 5 | Auto-buret set (white), 10 ml |
| 5 | " 25 ml |
| 5 | " 50 ml |
| 5 | Auto-buret set (brown), 10 ml |
| 5 | " 25 ml |
| 5 | " 50 ml |

| Quantity | Items and specifications |
|---|---|
| 2 | Filter paper, diam. 11 cm, 100 pcs/box |
| 10 | Precipitation tube, 50 ml |
| 1 | Precipitation tube stand, stainless steel |
| 10 | Precipitation tube with cap (brown spits-type), 10 ml |
| 10 | Test tube with cap (brown), 10 ml |
| 1 | Test tube stand, stainless steel |
| 1 | Vacuum bag sealing machine for laboratory use. |

ANNEX III

## PROJECT IMPLEMENTATION SCHEDULE

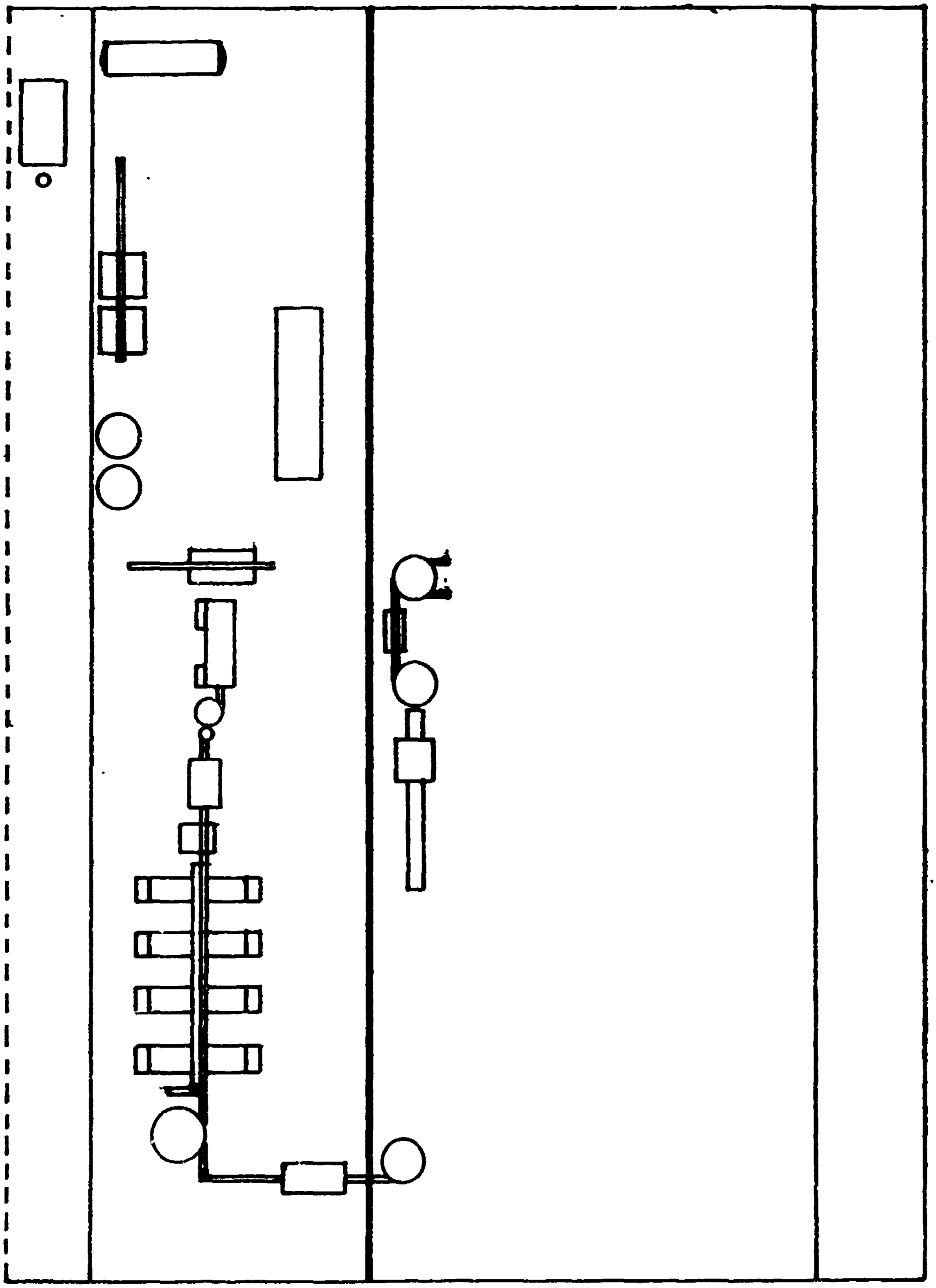
| Actions | 1990 | | | | | | | | | | | | 1991 | | | | | | | | | | | | 1992 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | J | F | M | A | M | J | J | A | S | O | N | D | J | F | M | A | M | J | J | A | S | O | N | D | J | F | M |
| Tendering | | xxx | | | | | | | | | | | | | | | | | | | | | | | | | |
| Evaluation | | | x | | | | | | | | | | | | | | | | | | | | | | | | |
| Purchase | | | xx | | | | | | | | | | | | | | | | | | | | | | | | |
| Manufacturing | | | | xxx | xxx | xxx | xxx | xxx | xxx | | | | | | | | | | | | | | | | | | |
| Transport | | | | | | | xxx | xxx | | xxx | | | | | | | | | | | | | | | | | |
| Erection | | | | | | | | | xxx | xxx | xxx | | | | | | | | | | | | | | | | |
| Running-in | | | | | | | | | | | | xxx | | | | | | | | | | | | | | | |
| Commissioning | | | | | | | | | | | | x | | | | | | | | | | | | | | | |
| CTA | xxx | | | xxx | xxx | x | | | xxx | xxx | xxx | xxx | xxx | xxx | xxx | xxx | | | | | | xxx | xx | | xxx | xxx | |
| QC | xxx | | | | | | | | | xxx | xxx | xxx | xxx | xxx | | | | | | | | xxx | x | | | | |
| Study tour | | | | xx | xx | | | | | | | | | | | | | | | | | | | | | | |
| Fellowship | | | | | | | | x | xxx | xxx | xxx | | | | | | | | | | | | | | | | |
| Exp.final rep. | | | | | | | | | | | | | | | | | | | | | | | | | | xxx | |
| Tripartite rev. | | | | | | | | | | | | | | | | | | | | | | xxx | | | | | |

CTA:
- 09/4 to 22/4/90 Preparation of study tour
- 23/4 to 13/5/90 In Denmark with the group
- 14/5 to 30/5/90 In Thailand and Vietnam with the group
- 31/5 to 17/6/90 Writing of report and planning the fellowship
- 01/9 to 28/4/91 Work at SEAPRODEX
- 16/9 to 30/11/91 Work at SEAPRODEX
- 02/1 to 28/2/92 Work at SEAPRODEX

QC:
- 29/10 to 28/2/91 Work at SEAPRODEX
- 30/9 to 10/11/91 Work at SEAPRODEX.

ANNEX IV

LAYOUT OF THE CANNING LINE
SEAPRODEX PLANT NO.2



ANNEX V

People met:

| | |
|---|---|
| Mr. Nguyen Hong Can | Director General of SEAPRODEX; Vice Minister. Ministry of Aquatic products SR, Viet Nam |
| Mr. Tran Van Tri | Deputy Director of Aquaculture Center, Deputy Manager on Foreign Investment |
| Mr. Nguyen Huy chuong | Chief of Section, Economic Relations Department, Council of Ministers |
| Mr. Lars S. Adermalm | Field Officer, UNDP, Deputy to the UCD |
| Mr. Le Quang Nghia | Administrative Assistant, UNDP |
| Mr. Kieu Chau Hoan | Commercial Deputy Director of SEAPRODEX Plant No.2 |
| Mr. Hoang Vinh | Marketing and International Cooperation Department |
| Mr. Nguyen Dinh Hung | Vice Director, Special Aquatic Processing Products Export Factory |
| Mr. Tran Nhat Anh | Vice Director General, Vietnam National Sea Products Export Corp., Hanoi Branch |
| Mr. Lam Duc Dinh | Director, Export Aquatic Products Quality Center |
| Mr. Nguyen Ngoc Son | General Director, SEAPRIMFICO |
| Mr. Duong Van Ve | Vice Director General, SEAPRIMFICO |
| Mr. Truong Anh Cam | Vice Director, SEAPRIMFICO, Factory No. 6 |
| Mr. Nguyen Quang Dinh | Vice Director, SEAPRODEX Factory in Vung Tau |

ANNEX VI

Project in the Socialist Republic of Viet Nam

**JOB DESCRIPTION**

DP/VIE/87/002/11-01/J 13103 (Ole Kirkegaard)

| | |
|---|---|
| Post title: | Chief Technical Adviser (Senior Fish Processing Expert) |
| Duration: | 1st split mission - 0.7 man-months -3 weeks (Total duration: 15 m/m - in 3 split missions) |
| Date required: | 2 to 22 January 1990 |
| Duty station: | Ho Chi Minh City, with travel within the country |
| Purpose of project: | To increase the quality, quantity and variety of marine products processed by SEAPRODEX Plant No.2 and to disseminate fish/food processing technologies and quality control procedures gained through this project to other processing plants in Viet Nam. |
| Duties: | The Chief Technical Adviser, working under the general guidance of the National Project Director and in close cooperation with the project administration and the Government authority concerned, will specifically be expected to carry out the following duties: |

- Supervise and coordinate the project activities in general;
- Advise and assist in the final identification and specification of technological equipment and related auxiliary facilities and in installation of the same;
- Assist and take part in the test run of the plant and in the plant commission;
- Assist in conducting plant runs for experimentation and on-the-job training purposes and use of the plant for the production of new products and quality control;
- Assist in the preparation of development and services work programmes for the canning line;
- Prepare a programme for the training through study tours and fellowships abroad of four team managers and eight senior specialists and technologists of the laboratory and production;
- Train eight senior staff members of Plant No.2 in quality control, fish processing and maintenance of the plant equipment;

- Assist in in-plant training of technical personnel from other fish processing plants in fish handling, different production technologies/methods and development of new products;

- Prepare work programmes and procedures of applied research activities of SEAPRODEX and conduct research work on various products and development of new products;

- Compile and report on the results of the R & D activities indicated above;

- Determine the feasibility parameters and conditions for the installation of industrial-scale, highly efficient fish processing plants, including improved methods of fishing;

- Eventually prepare one or more investment project(s) in accordance with the findings of the activities above;

- Take part in the preparation of work programmes and procedures of services to be provided to other industries in quality control, testing and certification of fish products;

- Take part in the definition, regulation and enforcement of national norms and quality standards of fish products;

- Take part in the preparation of manuals describing the methodologies to be applied for the verification of compliance to the norms and standards as indicated in the activity immediately above.

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

Qualifications: High-level senior fish processing expert specialized in modern fish processing technologies, product development and storage techniques.

Language: English, Vietnamese

Background information: Viet Nam possesses a coastline of 3,260 km and has a total sea surface of 1.000,000 km2 (based on 200 nautical mile EEZ). Furthermore, Viet Nam has an aquatic area of 1.350,000 ha as follows:

- Pond: 56,200 ha
- Field: 544,300 ha
- Big water surface: 394,500 ha

- Brackish tidal plain: 290.100 ha
- Bog: 26.700 ha
- Straits, bays: 56.000 ha
- Cultured area: 120.000 ha

The 1987 national fish catch and harvest compared to the highest catch in the past and to estimated future catches is shown in the table hereunder:

(1,000 metric tons)

| | Seawater fish | Shrimps | Inland fish |
|---|---|---|---|
| 1987 catch | 785 | 50-60 | 21-28 |
| Highest catch | 1.344 | 200 | 340 |
| Potential catch | 925 | 65 | 28 |
| 2000 estimate | 1.250 | 100 | - |

Catches of special species in 1987 were the following:

- Squid : 12,900 mt/year
- Other fish types : 22,200 mt/year
- Lobster : 1,000 mt/year
- Slipper lobster : 26.300 mt/year
- Acetes : 62,000 mt/year
- Crab : 3,400 mt/year

The approximate total number of fishermen in Viet Nam is 250,000; 43,490 are operating outboard and 32.021 inboard engine boats.

At present, there are about 63 fish processing plants in Viet Nam. They are able to freeze 353 mt/day and can hold 8,200 mt in their cold stores. Three of them are canning plants but none is operating efficiently mainly due to the lack of skilled personnel. Other plants are producing dried or frozen fish, such as squids, shrimps, scallops, mackerel, pompfret, red snapper, grouper, catfish, shark fin and some minor types.

The fishery sector plays an important role in Viet Nam's economy. It is one of the major sources of foreign currency earnings and a major employer. Although in 1987 the industrial production of fish reached 1 million tons, total exports were 92,897 mt only (constituting 9.2% of the total catch).

There are difficulties to produce high quality processed fish in Viet Nam. One major reason is the insufficient supply of ice for fish storing, neither for the boats nor for the landing sites. Another main problem is the poor hygienic standard of buildings, drains, water basins, processing equipment, process water and personnel.

The Government's plan to support the fishery industry recognizes the above-mentioned facts and aims at getting foreign expertise, equipment and establishing joint ventures to upgrade the industry. Special emphasis is given to the training of the local labour force in the new process technologies, packaging methods, laboratory techniques and quality control schemes.

B. 2nd split mission - 2.2 man-months - 9 April to 15 June 1990

1. Study tour

Project implementation has now started in its first phase with the study tour of 5 Vietnamese counterpart staff to Denmark and Thailand; the study tour participants were:

| | |
|---|---|
| Mr. Vo Van Trac | Vice Minister of Fishery |
| Mr. Kieu Chau Hoan | Vice Director of SEAPRODEX Plant No.2 |
| Mr. Nguyen Dinh Hung | Vice Director of SEAPRODEX Plant No.2 |
| Mr. Lam Duc Dinh | Director of Quality Control Department |
| Mr. Hoang Vinh | Secretary VIE/87/002 |

The group travelled to Denmark on 23 April and stayed until 16 May 90; during this period the group visited several departments under the Danish Ministry of Fishery and was infored how the Ministry deals with quotas, how the quality of the fish landed at the harbours is being controlled and how rules for the fish industry are established to upgrade the quality of the products and which equipment is used in the production.

The group was trained at the North Sea Center for one week by teachers from the Ministry of Fisheries, Development and Laboratory Department, in catch handling, fish landing, fish processing, fish storage and quality control and management of fish processing industries. During this period the group was visited the harbour of Hirtshals; this harbout is an integrated fish harbour with all facilities, like auction hall, flake ice plant, cold store facilities, wharf and workshops connected to the fish industry. Visits to several canning factories and Danish equipment manufacturers were organized.

In Denmark the tour ended in Copenhagen, where the backstopping officer joined the group for discussions on the project. Mr. Galat informed the counterpart staff that Cabinplant appeared to be the best supplier for the canning line but there were some problems with the budget, caused by the fact that the project was one year delayed and that the US dollar had dropped about 20-25% from the time the project document had been prepared. The group agreed with the backstopping officer and the CTA that the best supplier for the project equipment would be Cabinplant. Further the fellowship training was discussed upon and it was agreed between all parts that the quality control staff should be trained in Japan and the technical staff in Thailand or Denmark and only for a period of 6 instead of 12 weeks.

On 16 May the CTA left for Thailand with the group of participants to visit manufacturers of empty cans and manufacturers of equipment. This visit proved very successful, it revealed that all equipment could be delivered from Thailand including the service. A meeting took place with Mr. Verasak, Director of the Songhkla Fishery College, who thought that there were no problems with regard to training of Vietnamese SEAPRODEX staff at his college.

Only a cable had to be sent to DOVE (Department of Vocational Education) who would then confirm the training. Mr. Veerasak was looking forward to a close cooperation with the Vietnamese Government.

2. DSA payment:

There have been problems with the payment of the DSA since the participants had to stay in Copenhagen 3 days longer, waiting for a flight to Bangkok and for these 3 days they were paid DSA at the Thai rate.

3. <u>Project status</u>:

The CTA has made the necessary drawings for the construction of the buildings. The NPD, NPC and the CTA had meetings with the Construction Department where all details were discussed. All parties agreed that the layout for the processing area was perfect. The construction company was to start the renovation of the buildings on 18 July and would have finished within 2 months. The areas was to be equipped in accordance with Danish standards so it can withstand all inspections and the production area is to be cooled to secure a low temperature in order to keep the quality of the fish at a high level. There were to be facilities for storage of the raw material (chilled room), empty cans and the finished products.

So far all has been handled perfectly from SEAPRODEX' side and there should be no more delay in project implementation provided the equipment arrives in time. The most necessary equipment has already been ordered and as soon as additional 198,000 US$ have been allocated to the project the rest will be purchased. It is very important that that happens within a short time otherwise the whole project will be delayed and the start-up can not take place in December 1990. The first equipment will be shipped during the week 39/40 and will be in Ho Chi Minh City during week 44.

The next study tour under the topic marketing has to be to Europe. The team is to consist of 3 members, the CTA suggests that this study tour takes place if and when the exhibition SIAL will be held in Paris this year. Then SEAPRODEX could have a stand at this exhibition, which is one of the biggest in Europe, where all buyers and sellers are represented. It would thus be the ideal place to get in touch with the market. The CTA suggests that in case the exhibition will not be held in 1990 the team visits some of the biggest importers in France, Switzerland, Germany and Denmark. SEAPRODEX officials prefer the CTA to accompany them to Paris and to arrange the tour but the final decision is up to UNIDO Vienna.

The CTA had meetings with the managing staff of SEAPRODEX to give lectures in production management and on the importance of hygiene in the production.

The NPD and the CTA worked out the new training programme for the 6 week fellowship and it was decided that the participants had to go to Thailand and Japan, if possible. The NPD has - in cooperation with the CTA - worked out a report on the study tour and sent it to UNDP/UNIDO Ho Chi Minh City for distribution to Hanoi and Vienna. This report describes the study tour in detail and it also includes a conclusion on the study tour.

The CTA visited Cabinplant and discussed the equipment ordered by UNIDO. Design details were agreed upon and the CTA asked the company to undertake all efforts to shorten the delivery time.

ANNEX I

# TRAINING PROGRAMME

| Activity/duration | Areas of training |
| --- | --- |
| Individual fellowship | |
| 1. Quality control of fishery products and canned seafood products (4 fellows, Head of QC Service, University degree in biochemistry, total 6 m/m) | - International standards and procedures in QC of fishery products;<br>- QC in management in fishery products industries;<br>- Physical and chemical analysis and microbiological evaluation techniques applicable to seafood products;<br>- Analysis of nutritional content of canned products, shelf-life testing, etc.;<br>- Design and operational features of instruments used for chemical and microbiological analyses and interpretation of results;<br>- Buyers' specifications of seafood, sampling and analytical procedures to comply with buyers' specifications;<br>- Uses of additives in seafood preservation and canning processes;<br>- Production management of seafood processing plant. |

| | | |
|---|---|---|
| 2. | <u>Seafood processing equipment, design design and maintenance</u><br>(2 senior engineers and 4 junior engineers, total 9 m/m) | Seafood preservation and processing technologies for cured (pickled, salted or smoked) products, precooked canned products;<br>- International standards of quality and buyers' common specifications;<br>- Design and operational features of preservation and processing equipment;<br>- Techniques of and equipment for handling and processing of fishery products; on-boat handling and preservation techniques; in-plant handling and preservation techniques;<br>- Theory and practice of various methods of seafood packaging;<br>- Quality standards and manufacturing techniques of packaging containers for precooked or cured products;<br>- Theory and practice of plant maintenance engineering and related management;<br>- Repair and preventive maintenance service for plant. |

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ANNEX II

## REVISED PROJECT IMPLEMENTATION SCHEDULE

| Actions | 1990 | | | | | | | | | | | | 1991 | | | | | | | | | | | | 1992 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | J | F | M | A | M | J | J | A | S | O | N | D | J | F | M | A | M | J | J | A | S | O | N | D | J | F | M |
| Tendering | | xxx | | | | | | | | | | | | | | | | | | | | | | | | | |
| Evaluation | | | | x | | | | | | | | | | | | | | | | | | | | | | | |
| Purchase | | | | | | x | | | | | | | | | | | | | | | | | | | | | |
| Manufacturing | | | | | | xxx | xxx | xxx | xxx | xxx | xxx | | | | | | | | | | | | | | | | |
| First shipment | | | | | | | | | | xxx | | | | | | | | | | | | | | | | | |
| Second shipment | | | | | | | | | | | | x | | | | | | | | | | | | | | | |
| Erection | | | | | | | | | | xx | xxx | xxx | | | | | | | | | | | | | | | |
| Running in | | | | | | | | | | | | | | xxx | | | | | | | | | | | | | |
| Commissioning | | | | | | | | | | | | | | x | | | | | | | | | | | | | |
| CTA | xxx | | | xxx | xxx | x | | | | xxx | xxx | xxx | xxx | xxx | xxx | xx | | | | | | xxx | xxx | xxx | xxx | xxx | |
| QC | xxx | | | | | | | | | | | | xx | xxx | xxx | xxx | | | | | | | | | | | |
| Study Tour | | | | xx | xx | | | | | | | | | | | | | | | | | | | | | | |
| Fellowship | | | | | | | | xxx | xxx | xxx | x | | | | | | | | | | | | | | | | |
| Experts final report | | | | | | | | | | | | | | | | | | | | | | | | | | xxx | |
| Tripartite review | | | | | | | | | | | | | | | | | | | | | | xxx | | | | | |

| | | |
|---|---|---|
| CTA: | 09/04 to 22/04/90 | Preparing study tour |
| | 23/04 to 16/05/90 | In Denmark with the group |
| | 17/05 to 31/05/90 | In Thailand and Viet Nam with the group |
| | 01/06 to 17/06/90 | Doing the report and planning the fellowship |
| | 01/10 to 28/04/91 | Working at SEAPRODEX |
| | 01/10 to 28/02/92 | Working at SEAPRODEX |
| QC: | 01/01 to 01/05/91 | Working at SEAPRODEX. |

ANNEX III

Project in the Socialist Republic of Viet Nam

**JOB DESCRIPTION**

DP/VIE/87/002/11-01/J 13103 (Ole Kirkegaard)

| | |
|---|---|
| Post title | Chief Technical Adviser (Senior Fish Processing Expert) |
| Duration | 2nd split mission (2.2 man-months, 2 months and 7 days) |
| Date required | 9 April to 15 June 1990 |
| Duty stations | Copenhagen, Denmark (22 days)<br>Bangkok, Thailand ( 7 days)<br>Ho Chi Minh City, Viet Nam (9 days) |
| Purpose of project | To increase the quality, quantity and variety of marine products processed by SEAPRODEX Plant No.2 and to disseminate fish/food processing technologies and quality control procedures gained through this project to other processing plants in Viet Nam. |
| Duties | The CTA, working under the general guidance of the National Project Director and in close co-operation with the project administration and the Government authority concerned, will be expected to carry out the following duties during the second split mission: |
| - | Regarding the training activities to be undertaken under this project plan the study tour for five study travellers to Denmark; accompany the group of study travellers in Denmark (from 9 to 22 April 1990) and in Thailand (from 23 April to 20 May 1990); |
| - | Supervise the progress of the project and advise the Construction Engineer (in Viet Nam from 21 to 30 May 1990); |
| - | Prepare the report and plan the follow-up activities (in Denmark from 31 May to 15 June 1990). |
| Qualifications | High-level fish processing expert specialized in modern fish processing technologies, product development and storage techniques. |
| Language | English, Vietnamese |
| Background information | With regard to the study tour the following is to be noted:<br><br>It is the aim of SEAPRODEX Plant No.2 to establish a production of fish and shellfish for export. Within |

the European Community Denmark is one of the most important fisheries nations (more than 90% of the Danish fish production is exported). Thus Denmark is considered an appropriate country for the study of production of quality seafood for export as well as for the collection of information on marketing and business practices in foreign markets for seafood products. The study tour is aiming at giving an introduction to the Danish fisheries and to the industries related to the fisheries, the processing industry and the industry serving the fisheries. Furthermore, the study tour will give a brief introduction to national and international regulations of the marine resources. In Thailand the objective of the tour will be to identify possible suppliers of cans for the factories in Viet Nam.

During the first part of the stay in Denmark meetings will be arranged in Copenhagen with the Ministry of Fisheries and laboratories working under the Ministry of Fisheries will be visited. The second part of the tour in Denmark will go to the North Sea Centre, which is located at one of the biggest fishing harbours in Denmark. Here the group will be given lectures in fish handling, processing, product development, quality control of raw materials and finished products. Visits will be arranged to the harbour, fishing vessels, the fish auction and the service facilities in the harbour, such as ice making plants, cold stores, a fish meal plant and other fish processing plants. During the last part of the tour in Denmark the group will visit processing plants for canning of fish and shellfish and manufacturers of equipment for the processing industry.

In Thailand special emphasis will be given to the identification of future suppliers of cans for SEAPRODEX factories and can manufacturers will be visited.

For background information on Viet Nam please refer to the original job description of the CTA.

C. 3rd split mission - 6.3 man-months - 11 November 1990 to 18 May 1991

## I. INTRODUCTION

This report is describing the status and results of the CTA's third return mission to Vietnam. The activities of the CTA started on 11 November 1990, where the CTA met as requested senior staff members of SEAPRODEX in Paris during a five day stay. The group continued directly to Viet Nam, where the duration of the CTA assignment was six months and ten days, a reduction from the originally planned 12 months.

The objectives of the project are:

- To increase the quality, quantity and variety of marine products processed by SEAPRODEX Plant No.2 and to disseminate fish/food processing technologies and quality conrol procedures gained through this project to other processing plants in Viet Nam.

- To establish an experimental plant module capable of developing recipes and producing commercial sample quantities of canned marine products with flexible processing vessels, and a canning line of maximum design capacity of 60 cans per minute and maximum working capacity of 24,000 cans per day (185 grams each, diameter 87 mm, height 40-116 mm).

The attempt to reach the objectives has, hereto, been successful. The flexibility of the plant, however, is not as good as anticipated in the original project description, due to reductions in the amount of equipment granted to the project.

Project status as per 19 November 1990

The CTA arrived at the project site on 19 November 1990 and started immediately an inspection of the ongoing work in order to check whether the constructions were in accordiance with the specifications agreed upon during the second phase of the project.

The work was found to have been carried out satisfactorily but several items have still not been completed, i.e.:

- Erection of partitions
- Dismantling of existing power supply
- Installation of lighting in the production area, changing-room, office area and boiler room
- Preparation of boiler room for installation of equipment
- Installation of air-condition
- Outlet system for process water, including purchase of gratings
- Installation of water supply in the production area
- Organization of storage facilities
- Purchase of wash basins and soap dispensers.

The water available is of inferior quality and the pressure is too low to cover the requirements for cooling of the retort. It is recommended to let the water pass a hydrophore and a filter.

It was decided to proceed with the construction according to a priority scheme agreed between the SEAPRODEX management (see Annex I), the local contractor and the CTA. It was also decided that the remaining construction work should be carried out by the local contractor in close cooperation with one SEAPRODEX engineer and the CTA.

The main strategy in establishing the list of priorities was to finish all necessary tasks in order to make the premises ready for installation of the production machinery and equipment when it arrived from Denmark.

It was decided at the meeting that installation of the equipment and completion of the construction of the facilities for the staff should be completed simultaneously.

<u>The following priorities were agreed upon:</u>

1. Erection of the partitions allowing sufficient space for the entry of the autoclave.

2. Construction in accordance with the specifications of the new outlet system for process water, including installation of syphon traps.

3. Dismantling of the existing power supply system and preparation of new distribution boxes for lighting and processing line.

Inspite of minor problems, mainly caused by misunderstandings due to the language, the work proceeded well and the buildings were ready for installation of the machinery when the first shipment arrived.

## 1. Installation of equipment

The <u>first shipment</u> arrived from Denmark during the first week of January 1991. Checking the content against the purchase order it was found that all equipment ordered had arrived in good condition.

The installation of the equipment was executed entirely by personnel from SEAPRODEX' Technical Department, under the leadership of two foremen. The foremen will be permanently attached to the department as chief technicians and will be in charge of repair and maintenance of the processing equipment.

It was found that tools and special equipment for installation and connection to public utilities of the new machines were very scarce, which from time to time made the installation more difficult.

The personnel had no skills in interpretation of technical drawings and special instructions had to be given before installation could begin, particularly regarding wiring and piping. The lacking skills caused errors and unnecessary delays.

Due to good working spirit, slightly enhanced by introduction of a bonus system, the installation of the first shipment was completed two weeks before the arrival of the second shipment.

The time between the completion of the first shipment and the arrival of the second shipment was mainly used for calls at landings and ports in the Kiengiang and Thuan Hai Provinces (see Annex II).

The <u>second shipment</u> arrived during the last week of February and was cleared through customs in two days. Checking the shipment against the purchase order it was found that all equipment ordered had arrived in good condition.

During the installation the electricians, by mistake, connected the earth lead to the 0-wire in the three phase AC system. The error was found and corrected during the test run of the autoclave, no damage was caused to any of the equipment. Apart from the above problem the installation proceeded in a satisfactory manner and was completed on 9 March 1991.

2. Training, on-the-job and out-of-house

2.1. In-house training

Prior to the arrival of the equipment the CTA presented three lectures for the managerial and technical staff (procedures for production of different types of seafood products). The lectures included policies for maintenance of required hygienic standards.

After the equipment had arrived the purpose and function of each machine was demonstrated. The demonstration was made prior to installation due to easy access to the machines from all angles.

During the progress of the installation the purpose and function of the machines were repeated and the machines were tested to the extent possible without electricity. At the same time the CTA took the opportunity to carry out "on site" training of the staff in hygiene and safety procedures, welding of high pressure steam pipes and selection of paint and electrical switches.

It was not possible to practice production procedures during installation as the staff for the working stations on the production line was only hired after the installation had been completed.

2.2. Training at other plants

During the time from completion of the installation of the first shipment to the arrival of the second shipment the CTA visited SEAPRODEX Factory No.6 and several factories in Vung Tau and Nha Tang.

At all plants visited it was noted that the production methods used were very primitive compared to even other developing countries and as a result the hygiene was low and did not live up to the standards required in the countries Viet Nam would prefer as export targets.

Further the products, even from high quality raw material, were simple and "old fashioned" and would, therefore, meet fierce competition on the world market.

The fishing ports and landing places for fish visited by the CTA were almost without the most basic facilities for proper handling and storage of fresh fish and maintenance of fishing vessels.

As a result of the lacking facilities the post harvest loss in Viet Nam is above average for developing countries. The main problem for the fishing industry in Viet Nam is not to catch more but to prevent the present good catches from spoilage.

The conclusion of the CTA was that Viet Nam, today, is producing low price products due to lack of infrastructure, modern production machinery and know how in fish processing technology. Even if good quality raw material is available the processing plants are only able to produce low quality products.

The managers of the processing plants visited acknowledged the problem, and to a certain degree knew what had to be done to solve it. As an example it was seen that many processors are acquiring refrigerated trucks and only about 50% of the fish landed is now moved from the port to the factory in open vehicles.

This shift to refrigerated trucks is extremely important as the temperature in the baskets in the open trucks easily reaches 26° C (measured temperature), which inevitably spoils the fish. But also in the refrigerated trucks part of the fish is spoiled, since the fish is still kept in baskets which are stacked on top of each other, with the fish on top crushing the fish underneath, a problem which could be solved by introduction of modern fish boxes which can be stacked.

It was repeatedly mentioned during the port visits that one of the main constraints for a more rapid modernization of the fishing industry is uncertainty among the plant managers regarding which governmental department to approach for financial and technical assistance when a plant wants to purchase and install the modern equipment necessary for production of value added products.

Some of the processing plants have already purchased new IQF freezers but due to lack of technical assistance the equipment has been chosen with the price tag as sole criterium and the cheap equipment purchased can not meet the product standards required in USA and Europe.

## 3. Production experimentation

Experimental production of several product types was planned in the original project document, using the machinery and equipment described in the same document. The products mentioned in the project document were:

| | |
|---|---|
| Sardines | Tuna |
| Mackerel | Seafood cocktail |
| Clams | Shrimps |
| Scallops | Crab meat |
| Bird-nest soup | Shark-fin soup |
| Fish bladder soup | |

Due to reductions in the equipment delivered it was only possible to produce canned products of:

Sardines
Tuna
Mackerel
Seafood cocktail

SEAPRODEX and the NPD decided, with regret, that the best training approach to the reduced programme would be to concentrate the efforts on products which can be produced with the available equipment.

As practical training in new product development SEAPRODEX, the CTA and the QCE decided to use a mix of raw material, consisting of 40% shrimps, 30% mussels and 30% squids in the "Seafood cocktail".

During the experiments the staff learned that the different products in the cocktail had different characteristics regarding cooking loss and the staff, therefore, carried out a series of experiments with each product showing the loss in relation to the cooking time for each product.

Based on the results it was possible to establish a table, showing the volume necessary of each raw material type in order to achieve the desired 40%/30%/30% mix in the final product at different cooking time.

The importance of retort time for the texture and dryness of the final product was emphasized and test runs were made to illustrate that too long time in the retort resulted in a sterile product with an unacceptable dry texture, while too short time resulted in too high bacterial count, but fine and acceptable texture.

## 4. Determination and quality features

It was requested by SEAPRODEX that the products produced in the factory should accommodate the quality standards for canned products in USA and Europe. In order to achieve this goal special attention was paid to the standard of rooms and equipment (see Annex 5?).

SEAPRODEX purchased new adequate uniforms for the entire staff and new toilet facilities with showers and wash basins and a new staff restaurant were established in order to prevent the staff from leaving the premises during working hours. These precautions are to prevent contamination of the premises and the uniforms with soil and dirt dragged in during e.g. lunch hours.

After identification of the products which could be produced on the processing line the NPD and CTA started a search for raw material of suitable quality. Sources for mackerel and tuna of good quality were found without difficulty while sardines were more difficult to find in a proper condition due to post harvest spoilage.

Processing of mackerel, tuna and sardines was as far as possible organized in such a way that major changes in production procedures from product to product were reduced to a minimum.

Raw material for production of the seafood cocktail was mainly purchased semi-manufactured already prepared for canning. Only the squids had to undergo further processing at the plant.

## 5. Test run

### 5.1. Start-up and test run without product

The start-up was carried out in the following order:

- Boiler
- Cooker
- Process line
- Retort

5.1.1 Boiler

During the first day of the test run the steam pressure in the boiler was increased in intervals to the recommended working pressure of 8 bar. The operation was executed without problems.

In order to check the safety valves the steam pressure was further increased and it was noted that the valves opened at 8.5 bar and closed at 8.1 bar as prescribed.

The first water fed to the boiler had an admixture of chemicals for cleaning and protection of the boiler and the pipes. The steam pressure was, therefore, kept at the maximum allowable level during the test run to ensure a best possible effect of the chemicals and at the same time to check the quality of the welding.

The second day the feed water was replaced by clean water without chemicals and the temperature was again increased to bring the steam pressure up to working level.

When the pressure reached 8 bar the steam was blown through all the pipes at full pressure in order to remove excess chemicals from the pipes and valves. The main valve at the boiler was closed and after reducing the steam pressure in the pipes the dirt collectors were dismantled and properly cleaned before re-fitting.

No leaks were observed in the pipe system and the only defect was the one-way-valve, which was fitted upside down when assempled at the factory. When this fault was corrected the boiler and the control panel operated according to the specifications.

5.1.2. Cooker

The cookers were tested with water and crates and no failures or shortcomings were observed. The cooker and the crane, feeding the crates into the cooker, worked according to the specifications.

5.1.3. Process line

The process line was tested with empty trays. The trays are locally produced stainless steel trays but unfortunately the manufacturer of the stainless steel is also working with iron. The result are small iron particles mixed into the stainless steel causing a rusting of the trays.

Water outlets and reduction valves were missing for two working stations on the line. These shortcomings should be corrected, free of charge, by the supplier.

5.1.4. Retort

The retort was tested in accordance with the directions supplied by the manufacturer. During the test it was observed that problems occurred when water was fed to the retort. The error was found to be caused by an erroneous connection of the earth- and the O-wire in the control panel. When the error was corrected the autoclave worked satisfactorily from the mechanical point of view.

The computer controlling the retort did not accept loading of the software provided by the manufacturer. The lack of performance was caused by an error in the manual. The manual was corrected by the manufacturer, by telex, after which the retort worked according to the specifications.

## 5.2. Start-up and test run with products

When the first shipment of cans arrived at the factory the same procedure as described under test run without products was repeated with products.

### 5.2.1. Flow chart and labour plan

The production is separated into 7 operations as follows:

GUTTING
4 persons

COOKING - SERVICE
2 persons

FILLETING - SERVICE
9 persons

PACKING - SERVICE
10 persons

SEAMING - FILLING
5 persons

RETORT
1 person

LABELLING - STORE
6 persons

### 5.2.2. Canning of tuna

On the first day a batch of 200 kilo canned tuna was produced in a four hour period. The very low production was due to intensive training of the entire staff during each step of the process. The equipment performed impeccably during the test run. The efficiency and skills of the staff improved from day to day and after only a few days the productivity increased remarkedly.

The planned target of 8 MT of canned tuna per eight hour shift is expected to be reached within a short period of time.

### 5.2.3. Canning of sardines

A most satisfactory test run was carried out using sardines as raw material. The only delaying factor was the staff's exaggerated care in cleaning the sardines. When the staff was trained properly in using efficient methods for cleaning the sardines a satisfactory production level should be reached without difficulty.

The good results achieved during the test run should be credited to the SEAPRODEX staff who worked with enthusiasm and discipline.

In order to reach and maintain a commercial production level it will be necessary to provide the equipment originally described in the project document. Without this equipment the production is difficult and rejections from the markets will be unavoidable. Such rejections again will influence the present high level of pride and enthusiasm among the staff and management.

## 6. Project status as per 1 May 1991

### 6.1. Products

The products deriving from the production at the SEAPRODEX facility fully comply with the norms and standards required by the Western world. From the product standard point of view it should, therefore, be possible to export the products.

### 6.2. Machines and equipment

The machinery and equipment are working according to the specifications, but hte production is far from rational as too much manual work is involved in the process.

The processing line installed at the SEAPRODEX facility is reduced in comparison with the line originally described in the project document and it is, therefore, only possible to produce three of the planned 10 to 15 different products.

The line is only capable of handling fish products which are manually filleted or nobbed.

As no round-filler is present smaller products such as shrimps and mussels can not be filled into cans and due to lack of cooking equipment and pumps the planned range of soups can not be produced.

It is not possible to produce a proper brine/tomato sauce as no mixing unit is existing.

The overall presentation of the finished products is inferior as labelling has to be made by hand and, therefore, is inaccurate and of poor quality. This labelling method will effectively exclude export to markets in Japan, USA and the EEC as labelling requirements and presentation of products in these markets follow strict regulations.

7. Visit to GIA Fair, Paris and Market test

One of the tasks of the project was to test recipes of 10 to 15 canned seafood products in the local market and the export markets. Priority items should include:

- Clams
- Shrimps
- Scallops
- Crab meat
- Bird-nest soup
- Shark fin soup
- Fish bladder soup

As indicated in the Job Description of the CTA the third phase of the project started in Paris, France, on 12 November 1990, where the CTA met Mr. Thu and Mrs. Hue from SEAPRODEX.

The purpose was to visit the GIA Fair and to discuss product specifications and quality standards with potential French buyers, selected and introduced to the group by SEAPRODEX' French joint venture partner Favigel.

As the expected quality standard of the products, as described by the group, was satisfactory, the potential buyers were interested in the planned product line.

It was, therefore, decided to send samples of the products as soon as possible to Favigel who would distribute the products to the buyers for final testing in France before final purchase contracts were negotiated.

It has not been possible to carry out this test, as delivery of cans for the products has been severely delayed. From 1 June 1991 it was then possible to send samples to Europe and to the traditional SEAPRODEX customers.

Feedback on the quality and customers' acceptance of the samples was not yet received at the departure of the CTA.

In Paris the group visited the GIA Fair to study the latest machinery for production and packaging of products similar to those planned at the new SEAPRODEX facility.

The GIA Fair showed the Vietnamese participants how seafood products are produced in the industrialized world and the type of products SEAPRODEX would have to compete with in the USA and Europe. Visiting the GIA Fair made it obvious to the participants that the reduction of the original project equipment would make competition very difficult.

RECOMMENDATIONS

A. Equipment

Before a production of export quality seafood in commercial quantities will be possible in Viet Nam, it will be necessary to upgrade the infrastructure. The poor facilities at the ports and the out-dated transportation system almost inevitably render the good fish caught unfit for human consumption before it reaches the processing plant, and even the most modern machinery is unable to improve the quality of already spoiled fish.

Future deliveries to Viet Nam of food processing equipment should include a complete workshop for fitting and maintenance to make welding and fitting of stainless steel pipes possible.

It would be advantageous if in the future the technical staff attends a course in reading drawings before another installation of equipment starts.

The manual fish handling and cleaning processes should be substituted by mechanic equipment in order to improve efficiency and safety.

The machines and equipment excluded from the original project document should be reconsidered, most obviously needed equipment is listed below, with the indication of FOB Denmark prices in DKK.

| Project Doc. | Description | Price FOB Denmark |
|---|---|---|
| Pos. 10 | Washer for empty cans | DKK 177,500.- |
| Pos. 12 | Pneumatic pusher | DKK 17,800.- |
| Pos. 13 | Rotary pocket filler | DKK 331,100.- |
| Pos. 14 | Check weigher | DKK 242,500.- |
| Pos. 20 | Crate emptying unit | DKK 109,800.- |
| Pos. 21 | Table | DKK 21,400.- |
| Pos. 22 | Labelling machine | DKK 225,900.- |
| Pos. 23 | Round table | DKK 30,800.- |
| Pos. 24 | Carton sealing machine | DKK 45,200.- |
| Pos. 25a. | Roller conveyor | DKK 11,800.- |
| Pos. 25b. | Roller conveyor | DKK 2,900.- |
| Pos. 26 | Mixing device | DKK 371,600.- |
| Pos. 27 | 2 x Cooking vessles | DKK 390,600.- |
| Pos. 29 | Water treatment unit | DKK 21,200.- |
| Pos. 30 | Pressure cleaner | DKK 33,200.- |
| Pos. xx | Complete tool set | DKK 220,000.- |
| TOTAL | | DKK 2.253,300.- |

Using the exchange rate of 1 September 1991 the DKK amount is equivalent to US$ 335,163.

This equipment should be purchased in order to reach a rational and efficient production level which would lead to fulfillment of the objectives of the project as established in the project document.

Funds for the purchase of machinery and technical assistance should be applied for through UNIDO/UNDP in order to complete the project as described in the project document.

If no funds for the completion of the project can be raised the CTA would recommend that at least the training components should be completed according to the original plan.

In order to ensure a timely continuation of the project the CTA should complete a report in Viet Nam so that the project can be revived when financing can be obtained. The time required for the preparation of a final report is estimated at about one man-month.

B. Training

As an extra component of the project the CTA would recommend a management training programme for the local managers. Such a programme would be a valuable addition to the project.

C. Financing

The funds required to bring the project up to a level as described in the project document is calculated as follows:

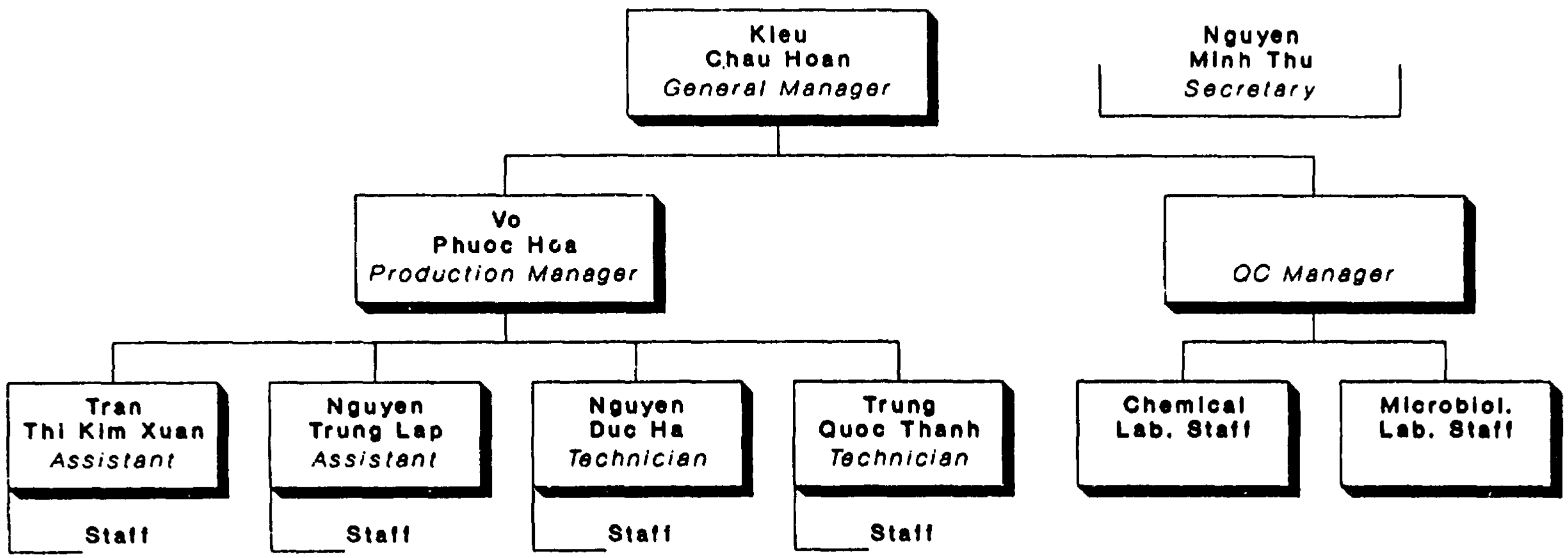
| | |
|---|---|
| Training in Denmark for QC staff | US$ 90,000 |
| Required equipment | US$ 260,000 |
| Salary CTA | US$ 58,500 |
| Salary QCE | US$ 26,000 |
| DSA | US$ 22,000 |
| Travel expenses | US$ 11,000 |
| TOTAL | US$ 467,500 |

If it is decided to stop the project and to prepare a final report at this stage the cost would be:

| | |
|---|---|
| Training in Demark of QC staff | US$ 90,000 |
| Salary CTA | US$ 13,000 |
| DSA | US$ 3,000 |
| Travel expenses | US$ 5,500 |
| TOTAL | US$ 108,500 |

In both cases DANIDA has indicated that it will look favourably on supporting and financing the training programme in Denmark for the QC staff.

# SEAPRODEX Plant No. 2
## Organization Chart






ANNEX I

# ANNEX II Call at Ports and Landings

## A. People met.

**Kiengiang Province.**

| | |
|---|---|
| Director of Fisheries: | Mr. Nguyen Duc Thang |
| Vice Director of Fisheries: | Mr. Nguyen An Cu |
| Vice Director of Fisheries: | Mr. Tran Bin Ton |
| Director of Marine Factory: | Mr. Hai Hung |

**Thuan Hai Province.**

| | |
|---|---|
| Vice director of Economic Relation: | Mr. Tran Kim Chau |
| Harbour Construction Engineer: | Mr. Nguyen Sang |
| Vice Director of Seaproduct Department: | Mr. Pham Hoang |
| Economic Engineer: | Mr. Le Duc Minh |

## B: Kiengiang Province.

**Rach Gia.**

The following species are found abundantly in the sea off Rach Gia:

- Tuna (bonito)
- Horse mackerel
- Spanish mackerel
- Sardine
- Anchovy
- Red snapper
- Pomfret
- Thread fin
- Conger

The total landings amounts to 100,000 MT per year of which Tuna, Horse mackerel, Anchovy and Sardine make up 40 percent.

**Processing.**

The fish landed in Rach Gia generally only undergo light processing, the existing factories only have a freezing capacity of 25 MT per 24 hour. The frozen products are mainly high value products, i.a.: Shrimps, Mackerel, Red Snapper, Pomfret and Crab.

Shrimps are, like in many other areas of South East Asia, block-frozen in five lbs. blocks and mainly as: Whole, head off/shell on or raw/peeled. The block frozen product is exported for further processing, mainly to Japan.

Further processing into different types of consumer packs should be established in Rach Gia as this would mean value added production in Vietnam. In the present block frozen form the low export value obtained by Vietnam has no relation to the high consumer price of the final product in Japan.

One of the factories in Rach Gia is presently involved in a joint venture with a Thai company establishing a production line for canned Tuna and Sardine. This production is expected to start in June 1991.

The most abundant fish species landed in Rach Gia are generally utilised as:

| | | |
|---|---|---|
| - Anchovy | : | Fish-sauce |
| - Sardines | : | Fish-sauce, dried |
| - Tuna | : | Exported iced to Thailand |
| - Spanish Mackerel | : | Exported iced to Thailand |

There are 20 ice plants for production of block ice in Kien-giang Province, they are all located strategically well, close to the harbour. The present daily capacity is estimated to 1,000 MT, which is sufficient to cover the present demand. If the demand from local consumers increases in the future, it is most likely, though, that the boats will suffer from lack of ice.

**Fishing vessels.**

There are approximately 5,000 fishing vessels in Kiengiang Province, of these 3,000 are under 20 GRT. These small boats only rarely carries ice on board.

The larger vessels, up to 150 GRT., carries ice on the fishing trips, but boxes are not used and the quality of the fish landed is, therefore, inferior.

**Rach Gia Fishing port.**

The fishing port is located in the centre of the town and the access to the port is difficult due to narrow streets. Several small shops are established in the port area and these shops supply the vessels with all their requirements.

The port in Rach Gia is used by a number of the vessels from the southern part or the Province. The major weakness is that the shallow drought during low tide limmits the access of larger vessels to high tide.

Containers can not be used in Rach Gia as no handling gear is available. Ordinary containers are sent by truck to Hon Chong, where 20' containers can be handled, while reefer containers have to be shipped via Ho Chi Minh City.

The major part of the landings from Rach Gia is iced and sent by truck to Ho Chi Minh City for further processing, a transport that lasts about 8 hours by roads in very poor condition.

The result is that the quality of the fish is substantially lower when the fish arrives in Ho Chi Minh City than in Rach Gia, which again is substantially lower than the intrinsic quality of the fish due to improper handling on the boats.

**Conclusion.**

As the port in Rach Gia is unable to service larger vessels, as the access to the port through the city is poor, and as the fishing industry can not be further expanded within the harbour area, this port was deemed without interest for further development.

The Fishery Department in Rach Gia and the CTA, therefore, looked at other development possibilities for the fishing industry in the area of Tac Cau, located 17 km. south of Rach Gia.

**Tac Cau.**

Previously Tac Cau was port of call for navy patrol vessels but it is now handed over to the Ministry of Fisheries who is using the port for their large trawlers.

The port is located inside the river delta and is, therefore, protected from the sea. Minimum depth at low tide is 1.5 to 3 meter along the pier.

The pier consists of a concrete deck placed on piles driven 6 meter into the river-bed, which, in this area, is sufficient to reach firm footing.

The pier is 75 meter long and four meter wide and can, therefore, only be used by smaller vehicles.

In connection with the port is a block ice unit with an estimated production capacity of approximately 100 MT per 24 hour.

The port has ample fresh water supply of good quality. If additional water should be needed deep wells can easily be drilled as FAO has found large resources of water in a depth of 120 meter.

The port has sufficient power supply for the time being and new power-lines could be drawn as needed.

The road to Tac Cau is in poor condition for the last five km. but the Ministry of Fisheries has granted USD 100,000 for reestablishment of the road.

If a proper Fishing Port is to be established in Tac Cau it would be necessary to reinforce two small bridges on the road to the port as these at present only can take loads of max. 8 and 13 MT respectively.

The local Committee has committed themselves to prepare the bridges if a fishing port is being located in Tac Cau.

Tac Cau has huge areas available adjacent to the river for construction of an major integrated fishery project.

Such a project should preferably consist of the following industries in order to service the reported amount of landings:

- Canning Factory
- Filleting and Freezing Factory
- Shrimp Factory
- Cold store
- Fish-meal Factory

In order to service the fishing fleet it should be recommended to establish a slipway and proper repair shops for gear and equipment.

**Conclusion.**

Tac Cau is considered outstanding for establishment of an integrated fishing project as it is not flooded during the rainy season and as all facilities are already present or can be constructed without major problems.

If a fishing port is established in Tac Cau the private fishing vessels would, most probably, increase in size, which would again result in longer fishing trips and increased landings creating more jobs and earnings to this poor part of the country.

## C: Thuan Hai Province.

Thuan Hai Province has a population of approximately 2 million people of which 500,000 are directly involved in the fishing industry. Employment in the fishing industry is increasing at a rate of approximately four percent per year.

Fishing vessels in Thuan Hai Province.

The total number of fishing vessels in Thuan Hai is 4,061 with a total of 63.724 horse power. The sizes are split up in the following groups:

| Engine size | No. of Vessels | % of total. |
|---|---|---|
| 1 - 10 hp | 2.331 | 57 % |
| 11 - 23 hp | 956 | 24 % |
| 24 - 44 hp | 494 | 12 % |
| 45 - 56 hp | 273 | 7 % |
| 57 - 66 hp | 5 | 0.12 % |
| 67 - 74 hp | 15 | 0.4 % |
| 75 - up hp | 7 | 0.2 % |

The larger vessels carry ice on their trips, but they stow the fish in bulk, without shelves or boxes. The result is that the fish in the bottom of the hold often are damaged by the weight of the overlaying fish and ice.

Some of the vessels do bring baskets but these are to big and, as the fish are placed in the baskets and ice only applied on top, the cooling effect of the ice is insufficient to properly cool the fish in the bottom of the baskets.

The baskets are furthermore stacked on top of each other and thereby squeezing the fish in the lower baskets, which has an even more detrimental effect on the fish quality than not using baskets at all.

Introduction of stacking boxes or shelves should be highly recommended.

The small vessels have no ice on board, but as the fishing trips are short the fish is relatively fresh when landed.

Landings in Thuan Hai Province.

The rich fishing grounds off Thuan Hai Province covers an area of 72,700 $km^2$. The landings in the Province in 1990 amounted to 140,000 MT mainly consisting of:

- Squid
- Cuttlefish
- Scallops
- Mussels
- Swimming Crabs
- Mackerel
- Tuna
- Lizard fish
- Anchovy
- Sardine

Thuan Hai Province has an existing freezing capacity of 28 MT per 16 hours, which is far below the capacity required if the landings are to be handled properly and post harvest loss reduced.

The landings in the Province could be increased and the post harvest loss reduced significantly if the port and processing facilities were improved.

Phan Thiet.

Phan Thiet receives the largest yearly landings in the Province, even if the port facilities are poor. The landings amounts to approximately 40,000 MT per year and could with improved facilities and introduction of vessels of 30 to 100 GRT probably be doubled.

Only a fraction of the landings are processed in Phan Thiet as the only facility is a freezing unit with a capacity of 6 MT per day.

Some of the landings are dried for sale at inland markets or, in case of Abalone, for export. A minor fraction of the landings is sold fresh, iced at the local market.

The bulk of the landings are sent by truck to other locations such as Ho Chi Minh City for sale or processing.

In the local freezing plant Grouper, Snapper, Hot tail, Lizard fish, and Cuttlefish are frozen in the round while Mackerel are filleted and frozen as single fillets.

Phan Thiet has several small ice units with a total capacity of approximately 300 MT per 24 hour.

**The Port.**

The port is located close to the river mouth in the outskirts of the town which gives relatively good access by road.

The port consists of a small wharf for unloading of fish and loading of ice. The larger vessels can not get alongside the wharf, but have to be unloaded by small tender boats.

The present port has no shaded area for keeping the fish between unloading and further transport which is detrimental to quality and increases the post harvest loss dramatically.

In connection with the port a small yard for construction and repair of boats up to 45' is located. A new fishing boat from the yard is priced at USD 8,900. The yard is not capable of servicing steel cutters.

A new harbour project is approved which will make landings from the larger vessels possible. Adjacent to the planned harbour is an area of 25 ha which can be utilized for auction hall and fish processing facilities. The area is expandable to 55 ha.

**Processing.**

A minor part of the landings in Phan Thiet is processed in the six factories located in the area, however, the major part of the fish are processed outside Thuan Hai Province. A fraction of the landings is sold as fresh fish at the local market or processed by private individuals into dried products.

**Conclusion.**

The new harbour project should be implemented as soon as possible, as it would reduce post harvest loss dramatically and at the same time attract both new industry and fishing vessels from other parts of the coast to utilize the new facilities.

Vung Tau.

The city of Vung Tau is an important fishing port where a substantial share of the raw material for the fishing industry and the markets in Ho Chi Minh City is unloaded.

There is at present three locations in Vung Tau where fish can be landed: Cang Ca, Ben Da and Ben Dinh. Calls were made at these facilities in order to study the present situation.

The landings in Vung Tau amounts to approximately 60,000 MT per year, consisting mainly of:

- Shrimp
- Squid
- Cuttlefish
- Tuna
- Mackerel
- Red snapper
- Sardine

Thirty percent of the landings are processed into frozen products for export, while the rest is either dried, sold as fresh fish on the local market, or processed into fish sauce or fish meal.

Vung Tau has a cold store capacity of 1,000 MT which is mainly used for block-frozen shrimps and squids for export.

A fish meal factory, which at present is producing 2,500 MT per year, is operating in Vung Tau. The raw material is fresh fish. The factory, however, operates on high temperature technology, which decomposes some of the proteins in the fish meal, resulting in a lower grade than could have been obtained if a modern low temperature facility was installed.

The existing two processing plants in Vung Tau needs improvement. It is unlikely that the plants would be allowed to export their products if inspected by officials from the importing countries.

Vung Tau has 1,200 fishing vessels between 10 and 750 hp. All vessels bring ice on their trips, but boxes are not used. As a result only a fraction of the landed fish is of a quality which could be used for production of export products.

**Cang Ca.**

Cang Ca is the most modern port in Vung Tau and is still under construction. When finished the port will have a 100 meter long pier, with pipes for bunker and fresh water. The pier has expansion possibilities for an additional 50 meter.

The area of the present port is only approximately 6,000 $m^2$. An adjacent area is until now not in use and could eventually be included in the harbour area, if negotiated with the local Peoples Committee.

The port can service ships of up to 10,000 GRT at high tide. At low tide the depth is reduced to approximately 7 meter, which is sufficient, though, to service even the largest fishing vessels in the area.

This port provides excellent possibilities for a major integrated fishery project.

**Ben Da.**

Ben Da is a small landing place for small vessels and boats, consisting of only two small jetties made up of small poles which are manually hammered into the river-bed and covered with loose planks. This construction is in fact dangerous to use for unloading operations.

Inside the area is an open shed with cement deck, but it seems to be very difficult to clean as the hygienic standard was very poor when visited. The area does not comply with international sanitary standards.

Inside the shed is an ice crushing machine. The crushed ice is carried manually to the boats via the dangerous jetties.

There are no supplies of water, bunker or other necessities for the boats and their crew.

**Ben Dinh.**

This port is operated by the Peoples Committee in co-operation with the small fishermen.

The only two structures within the rather large area available is a small jetty, which is difficult to use due to the tide, and a small building used for administration.

Ice is not available and the fish landed are, therefore, of low quality. Some of the boats carries salt and some of the catches, therefore, arrives salted.

The best squid and sardines are used for local drying. The landings of other species, which are acceptable for human consumption, are sold on the local market as fresh fish to local processors or to Ho Chi Minh City for freezing as whole fish or fillets for export.

Outside the port area is an old fish-meal factory that uses part of the sardine catch and all the fish deemed unfit for human consumption due to bad handling. The fish meal factory is old and the produced fish meal is of low quality.

The fish landed in Ben Da are sold through Peoples Committee who are also supplying the boats with all necessities.

Conclusion.

Cang Ca should not be considered for aid programmes as the development is already on the right track. It is necessary, though, to make planning for use of the available area for industries if this port should develop beyond the present status as a landing place.

The two locations Ben Da and Ben Dinh should be united into one and pontoon bridges should be constructed giving a constant working hight over the water. It is recommended to construct four pontoons each approximately 20 meter long.

It is furthermore recommended to construct a closed, cooled building for storage and sale of the landings, the same building could be used for crushing and storage of ice for the boats in order to reduce the post harvest loss.

If the above mentioned improvements are implemented, the artisanal fishermen, presently unloading on the beaches around Vung Tau, would most probably start to use the facility as higher prices should be obtained through centralisation. Likewise catering to the ships could be facilitated.

The recommended improvements would only require a limited investment as most of the needed components could be manufactured locally under guidance of a supervisor.

The improvements would result in increased landings of fish of a far better quality than at present, thereby reducing the post harvest loss dramatically.

Ho Chi Minh City.

Several Shrimp and Fish Processors are established in Ho Chi Minh City and these processors receive a large part of their raw material from the neighbouring Provinces by truck as iced whole fish or shrimp.

As Ho Chi Minh City does not have a fish-meal factory, none of the processors have any use for the major part of their offal, even if a small fraction is sold for use as feed in the shrimp-farms, either without treatment or, especially for shrimp offal, sun-dried.

The amount of offal produced in Ho Chi Minh City per year is:

- Shrimp offal 14,701 MT
- Fish offal 3,126 MT

This offal is wasted as it is simply dumped creating a great deal of pollution.

The offal could easily be utilized if a fish-meal factory was established and the product would be in great demand especially if a feed mill was established simultaneously.

The fish-meal produced from the offal could then be an important source of raw material for production of locally made shrimp feed pellets and thereby substitute part of the imported shrimp feed presently used in the shrimp farms and thereby save foreign currency.

Project in the Socialist Republic of Viet Nam

**JOB DESCRIPTION**

DP/VIE/87/002/11-01/J 13103 (O. Kirkegaard)

| | |
|---|---|
| Post title: | Chief Technical Adviser (Senior Fish Processing Expert) |
| Duration: | 3rd split mission (6.3 man-months = 6 months and 9 days) |
| Date required: | 11 November 1190 to 18 May 1991 (6.2 man-months) plus retroactive 2 and 3 April 1990 (0.1 man-month) |
| Duty station: | 12 - 16 November 1990: Paris (1 day briefing Vienna - 19 November 1990)<br>20 November 1990 to 14 May 1991: Ho Chi Minh City, Viet Nam (2 days debriefing Vienna - 16+17 May 1991)<br>2 and 3 April 1990: Vienna (consultation visit) |
| Purpose of project: | To increase the quality, quantity and variety of marine products processed by SEAPRODEX Plant No.2 and to disseminate fish/food processing technologies and quality control procedures gained through this project to other processing plants in Viet Nam. |
| Duties: | The Chief Technical Adviser, working under the general guidance of the National Project Director and in close cooperation with the project admiinstration and the Government authority concerned, will specifically be expected to carry out the following duties during the third split mission: |

- Install plant machinery and equipment and other auxiliary infrastructure; verify the adequacy of infrastructure installed by the national counterpart;

- Train (on-the-job) the operative personnel in maintenance and production functions; advise other fish processing plants/cooperatives in various aspects of handling and processing of fishery products;

- Prepare programmes for production experimentation; select product groups, prepare all possible alternative recipes, define target quality standards, etc.;

- Determine quality features for target products in order to establish related procedures for material handling and processing and prepare the relevant operational manuals;

- Carry out the test run of the plant;

- Implement the programme as indicated above, document and evaluate all results achieved; prepare an interim report on the status of the project activities;

- Accompany three study travellers during the Exhibition of Fisheries Industries, held in Paris from 12 -16 November 1990.

Qualifications: High-level senior fish processing expert specialized in modern fish processing technologies, product development and storage techniques.

Language: English, Vietnamese

Background information: Please refer to the other two job descriptions of the CTA.

**PART III** **TECHNICAL REPORT** by Iwao Mizuishi, Expert for fish testing and quality control - DP/VIE/87/002/11-02/J 13103

A. 1st split mission - 3 weeks - 4 to 21 January 1990

1. Purpose of the project

To increase the quality, quantity and variety of marine products processed at SEAPRODEX Factory No.2 and to disseminate fish/food processing technology and quality control procedures gained through this project to other processing plants in Viet Nam.

2. Observations of the expert

The consultant paid opportunity visits to some other factories of SEAPRODEX, i.e. Factories No. 6, 21 and 26 and inspected also fish landing places; his observations were the following:

2.1. Raw material

At the fish landing places more than 80 % of the fish were not handled properly. The ice sold at the landing places was very expensive, dirty bamboo baskets were used to transport the fish from the landing places to the processing plants and the local markets. Some of the fish to be transported by fish brokers over a longer distance was iced only on top of the fish baskets and covered with dried leaves. The raw material intended for export was iced immediately after the catch at the landing places. The quantity of ice available at the landing places was not enough compared to the volume of raw material.

2.2. Processing Plant

Each plant has enough space available for processing but the processing flow lines are not suitable to maintain good sanitary conditions. The doors and windows are often without screens and the floors in the processing areas show uneven surfaces and puddles here and there; workers are sweeping the floor with brooms and/or brushes. Often there is no hand washing water available, a wash basin is placed at the entrance for the workers of the plant.

2.3. Processing

The first stage of the process such as cutting off the heads and peeling the shells of the shrimps (including divan process) and/or skinning of squids and cuttlefish is carried out outside in the shade on paved ground. Block ice is used to chill the finished products. Raw material and/or processed products are placed directly on the floor without stands. Mechanical grading machines or other machines like filleting machines are not used, all processing is done manually.

2.4. Freezing and storing

For the freezing of fish products contact freezers are used, working at a freezing temperature of less than - 34°C, which is low enough for freezing. Cold storage temperatures are at about - 20°to - 25°C. Part of the cold store is a mixed store where also other food products like meat are stored. Floor pallets are used to store the finished frozen products but there is no space between the walls.

3. <u>Conclusions and recommendations</u>

The marine products harvested in the coastal waters around Viet Nam are handled and processed under the most undesirable conditions. In other words, it is impossible to produce high quality marine products for export even if they are processed in a modern processing plant. Before discussing quality control at the laboratory of the factory guidelines and/or codes of practice for handling of the marine products from the harvest to the final products are essential and have to be established.

The expert will, therefore, first elaborate such guidelines and/or codes of practice for handling of the marine products from harvest to processing. This will be done together with local laboratory staff, down to the plainest worker at SEAPRODEX.

It is essential to redesign the flow chart of the processing line for each processing plant of SEAPRODEX.

As mentioned in Annex I there are various chemical testing methods to determine the quality of the products related to enzymatic, bacterial activity, etc. However, the different methods are using various steps to obtain or extract material for testing or titrating with reagents, with the use of the relevant laboratory apparata.

Usually the laboratory of the processing plant should develop new products and the activities of the laboratory should be such as to minimize the risk of the factory. On the other hand the purpose of this project is to establish a new pilot plant for canning of various marine products.

4. <u>Selection of laboratory equipment and apparatus</u>

To stay within the limited project budget it has been agreed upon with the CTA and the NPD that the apparata to be used in the laboratory are to be mainly for inspection of the canned products, namely

(1) Histamine testing apparatus
(2) Precision thermometer and F-value computer (used for heat penetration determinations)
(3) Seaming head examination apparatus
(4) Vacuum meter
(5) Biological testing equipment

It was also considered that supply of these apparatus and equipment should be concentrated on one or two suppliers who are responsible also for service and delivery of spare parts. In addition, the suppliers should be very experienced in this particular field and should be familiar with the problems Viet Nam is facing with its marine products.

Fortunately, the Nissui Engineering Service Co. Ltd. has been experienced for many years in this particular field and has been cooperating with SEAPRODEX in the processing of canned crabs and tuna in the form of a joint venture in technical assistance and marketing of these products. And this company has also recently supplied a substantial volume of laboratory equipment to Factory No. 6 of SEAPRODEX, high in value.

ANNEX I

# LIST OF LABORATORY EQUIPMENT AND APPARATUS

1. Can testing equipment
2. General inspection equipment
3. Chemical analysis equipment (fat, VBN, histamine)
4. Bacteria analysis equipment (SPC, CG, EC, TSB)
5. Glassware
6. Chemicals and reagents

| No. | Name | Specifications | Q'ty | Kw |
|---|---|---|---|---|
| 1. | <u>Can testing equipment</u> | | | |
| 1 | Hand can vacuum tester | | 2 | |
| 2 | Vacuum tester | | 2 | |
| 3 | Micrometer | | 2 | |
| 4 | Slide caliper | | 2 | |
| 5 | Frat saw & J.G.saw | | 2 | |
| 6 | Seam slitting saw | | 1 | |
| 7 | Seam projector | | 1 | |
| 8 | Can opener | | 2 | |
| 9 | Incubator | MFR-113F 45x40x40cm | 2 | 0.4 |
| 10 | F -Value computer | | 1 | |
| 2. | <u>General inspection equipment</u> | | | |
| 1 | Refractometer N1 | Atago 0-32% | 2 | |
| 2 | " N2 | " 28-62% | 2 | |
| 3 | " N3 | " 58-90% | 2 | |
| 4 | " S10 | " 0-10% | 2 | |
| 5 | " S28 | " 0-28% | 2 | |
| 6 | Salinometer (digital) | NS-2P 0-9.99% | 1 | |
| 7 | Ph-meter (table) | HM-26S (0.01 Ph) | 1 | |
| 8 | Ph-meter (portable) | H-7 HP | 1 | |
| 9 | Thermometer (digital) | SK-1250 (0.1 ,-30-200) | 1 | |
| 10 | Moisturemeter w. printer | FD-230 (0-100%) | 1 | 0.4 |
| 11 | Chemical balance | ER-180A (0.1 mg) | 1 | |
| 12 | Portable scales | | 2 | |
| 13 | Magnifier | | 1 | |
| 14 | Distilled water maker | AWA-11 (11/h) | 1 | 1.0 |
| 15 | Distilled water r/bottle | 10 1 | 2 | |
| 16 | Washing bottle (polyethylene) | 12 each 250 ml,500 ml | 2dz | |
| 17 | Refrigerator | Home size | 1 | |

| No. | Name | Specifications | Q'ty | Kw |
|---|---|---|---|---|
| 3. | <u>Chemical analysis equipment</u> | | | |
| 1. | <u>Fat extraction unit</u> | WB-6S (6 stands type) | 1 unit | |
| 1.1. | Soxhlet fat extraction unit | Set of spare parts | 10 | |
| 1.2. | Water baths | | 1 | 1.2 |
| 1.3. | Cylindrical filter paper | No.84, cont.100 | 20 boxes | |
| 2. | <u>VBN analysis unit</u> | | 1 unit | |
| 2.1. | Conway analysis set | | 1 | |
| 2.2. | Conway unit w/band | | 10 | |
| 2.3. | Horizontal microburette | | 2 | |
| 3. | <u>Histamine</u> | | | |
| 3.1. | Centrifuge | | 1 | |
| 3.2. | Thermostatic water bath BK-23 | | 1 | |
| 3.3. | Chromatographic column TSK-gel LS-410K | | | |
| 3.4. | Chromatography | D-2500 | | |
| 3.5. | " | L-6000 | | |
| 3.6. | " | L-4000 | | |
| 4. | <u>Bacteria analysis equipment (for SPC, CG, EC, TSB)</u> | | | |
| 1 | Autoclave | HA24 | 1 | 1.5 |
| 2 | Sterilizing dryer | BKM-12S | 1 | 1.5 |
| 3 | Incubator | FDS-33S | 1 | 1.2 |
| 4 | Stomacher 400 | w/100 bags | 1 | 0.17 |
| 5 | Homogenizer | | 1 | 0.1 |
| 6 | Incubator | MFR-12S | 1 | 0.2 |
| 7 | Test tube | 15 x 1501 | 50 | |
| 8 | Test tube stand | 5 x 10 | 2 | |
| 9 | Darhum tube | 6 x 21 | 100 | |
| 10 | Glass plate | 90 mm | 50 | |
| 11 | Measuring pipette | 2 ml | 10 | |
| 12 | " | 10 ml | 10 | |
| 13 | Surgical scissors | | 5 | |
| 14 | " knife | m | 5 | |
| 15 | " pincette | | 5 | |
| 16 | Medical spoon | | 5 | |
| 17 | Measuring cylinder | 500 ml | 2 | |
| 18 | " | 100 ml | 2 | |
| 19 | Bottom flat flash | 1000 ml | 2 | |
| 20 | " | 300 ml | 5 | |
| 21 | Mercury thermometer | 200 C | 2 | |
| 22 | " | 100 C | 2 | |
| 23 | " | 50 C | 2 | |
| 24 | Gas burner for LPG gas | | 2 | |
| 25 | Wire net w/asbestos | 150 x 150 | 5 | |
| 26 | Triangle stand for asbestos net | | 2 | |
| 27 | Hand desinfection basin w/stand | | 1 | |
| 28 | Desinfection alcohol | 500 ml | 2 | |

| No. | Name | Specifications | Q'ty | Kw |
|---|---|---|---|---|
| 29 | Sanitary cotton | 500 gr | 1 | |
| 30 | Sulphate paper | 100 sheets | 1 | |
| 31 | Pipette cleaning siphon basin | PVC S | 1 | |
| 32 | Pipette cleaning basin | PVC S | 1 | |
| 33 | Pipette cleaning medicine | Decon 90 51 | 1 | |
| 34 | Hand desinfectant | Hibiden sol. 500 ml | 1 | |
| 35 | Standard agar | 300 g | 5 | |
| 36 | Desoxy cholate medium | 300 g | 5 | |
| 37 | E.C. medium | 100 g | 5 | |
| 38 | Colony counter | | 2 | |
| 39 | TGC medium | 300 g | 5 | |
| 40 | Washing brush for test tube | | 5 | |
| 41 | Washing brush for flask | | 5 | |
| 42 | Pipette drying cage | | 2 | |
| 43 | Test tube drying cage | | 2 | |
| 44 | Sterilizing box for pipette | | 2 | |
| 45 | Balance | 200 g | 1 | |

5. <u>Glassware</u>

| | | |
|---|---|---|
| 1 | Beaker (50, 100, 200, 300, 500, 1,000 ml) | 5 each |
| 2 | Flask (Erlenmeyer)(50, 100, 200, 300, 500 ml) | 5 each |
| 3 | Flask with cap (Erlenmeyer)(50, 100, 200, 300, 500 ml) | 5 each |
| 4 | Reagent bottle with cap (white)(30, 60, 120, 250, 500, 1,000 ml) | 5 each |
| 5 | Reagent bottle with cap (brown)(30, 60, 120, 250, 500, 1,000 ml) | 5 each |
| 6 | Dropping bottle (white)(60 ml) | 5 |
| | Dropping bottle (brown)(60 ml) | 5 |
| 7 | Funnel (dia. 60, 90, 120 mm) | 5 each |
| 8 | Flask volumetric (50, 100, 200, 250, 500, 1,000 ml) | 5 each |
| 9 | Measuring pipette (1, 2, 5, 10 ml) | 5 each |
| 10 | Hole pipette (1, 2, 5, 10, 20 ml) | 5 each |
| 11 | Measuring cylinder (10, 50, 100, 200, 500, 1,000 ml) | 5 each |
| 12 | Pipette komagome with spout (1, 2, 3, 5, 10 ml) | 5 each |
| 13 | Test tube (diam. 15 x 150) | 200 |
| 14 | Evaporating dish (diam. 60, 80, 100 mm) | 5 each |
| 15 | Auto-buret set (white)(10, 25, 50 ml) | 5 each |
| 16 | Auto-buret set (brown)(10, 25, 50 ml) | 5 each |
| 17 | Filter paper No.58 (D.11 cm) (100 pcs/box) | 2 |
| 18 | Precipitation tube (50 ml) | 10 |
| 19 | Precipitation tube stand S.S. | 1 |
| 20 | Precipitation tube with cap (brown spits-type)(10 ml) | 10 |
| 21 | Test tube with cap (brown)(10 ml) | 10 |
| 22 | Test tube stand S.S. | 1 |

6. <u>Chemicals and reagents for V.B.N. & Histamine analysis</u>

<u>For V.B.N.</u>

| | | | |
|---|---|---|---|
| 1 | $H_2SO_4$ | 500 g | 2 |
| 2 | HCI | 500 g | 2 |
| 3 | NaOH | 500 g | 2 |
| 4 | $H_3BO_3$ | 500 g | 2 |

| No. | Name | Specifications | Q'ty | Kw |
|---|---|---|---|---|
| 5 | $K_2 CO_3$ | 500 g | 2 | |
| 6 | $NA_2 CO_3$ | 500 g | 5 | |
| 7 | $CCI_3$ COOH | 500 g | 2 | |
| 8 | Glycerine | 500 g | 2 | |
| 9 | Methyl alcohol | 500 g | 2 | |
| 10 | Methyl red | | 1 | |
| 11 | Methyl orange | | 1 | |
| 12 | Brom cresol green | | 1 | |
| 13 | Tragant gum powder | | 1 | |
| 14 | Vaselyne | | 1 | |
| | <u>For Histamine:</u> | | | |
| 1 | $HCIO_4$ | 500 ml | 2 | |
| 2 | n-Hexane | 500 ml | 2 | |
| 3 | Dancyl chloride | 5 g | 2 | |
| 4 | Aceton | 500 ml | 2 | |
| 5 | Benzen | 500 ml | 2 | |
| 6 | Acetic acid | 500 ml | 2 | |
| 7 | Acetonitril | 500 ml | 10 | |
| 8 | Methyl alcohol | 500 ml | 10 | |
| 9 | Microsyringe | MS-50 50 ml | 1 | |

ANNEX II

Project in the Socialist Republic of Viet Nam

**JOB DESCRIPTION**

DP/VIE/87/002/11-02/J 13103 (I. Mizuishi)

| | |
|---|---|
| Post title: | Expert in fish testing and quality control |
| Duration: | 1st phase - 0.6 man-months - 4 to 21 January 1990 |
| Date required: | As soon as possible |
| Duty station: | Ho Chi Minh City, Viet Nam |
| Purpose of the project: | To increase the quality, quantity and variety of marine products processed by SEAPRODEX Plant No.2 and to disseminate fish/food processing technologies and quality control procedures gained through this project to other processing plants in Viet Nam |
| Duties: | the expert, in close cooperation with the Chief Technical Adviser, the National Project Director and the project administration, will specifically be expected to carry out the following duties: |

- Advise and assist in the final identification and specification of the laboratory equipment and instruments and related auxiliary facilities and in installation of the same;
- Assist and take part in the adjustment and test run of the laboratory and in the laboratory commission;
- Assist in conducting laboratory runs for experimentation and on-the-job training purposes and use of the laboratory for the production of new products under quality control;
- Assist in the preparation of development and services work programmes for the laboratory;
- Take part in the preparation of the programme for training through study tours and fellowships abroad of four team managers and eight senior specialists and technologists of the laboratory and production;
- Train eight senior staff members of Plant No.2 in quality control, fish processing and maintenance of the plant equipment;
- Assist in in-plant training of technical personnel from other fish processing plants in fish raw material quality control, sanitary and quality standards of fish processing and related testing/quality control techniques and in testing and quality control of new products;

- Take part in the preparation of work programmes and procedures of applied research activities of SEAPRODEX and assist in conducting research work on various products and development of new products;

- Prepare work programmes and procedures of services to be provided to other industries in quality control, testing and certification of fish products;

- Assist in servicing the industries in accordance with the programmes mentioned above in e.g. procedures on testing, analysis of products during the design phase, etc.;

- Define, regulate and enforce the national norms and quality standards of fish products;

- Prepare manuals describing the methodologies to be applied for the verification of compliance to the norms and standards as indicated in the activity immediately above.

The expert will also be expected to take part in the preparation of the terminal report, setting out the findings of his mission and recommendations to the Government on further action which might be taken.

Qualifications: High-level senior fish quality control expert, specialized in testing of raw material production inputs like water, production facilities and final products and familiar with international norms and standards of fish products.

Language: English, Vietnamese

Background information: Please see background information in the first job description of the CTA.

**PART III** **TECHNICAL REPORT** by Bent Andreasen, Expert for fish testing and quality control - DP/VIE/87/002/11-02/J 13103

**B.** **2nd split mission - 4.0 man-months - 30 January to 29 May 1991**

## 1. Installation of Equipment and Test Run.

The Quality Control Expert (QCE) assignment to the project has been divided into two phases, as the specialist from NISSUI, Japan, who was in charge of the purchase of all the laboratory equipment, due to health problems had to resign from his assignment with the project after completion of phase 1.

The responsibility for the completion of the work (phase 2) included in the Terms of Reference was handed over to R & H International who appointed Mr. Bent Andreassen as QCE to undertake the task.

The QCE arrived on site January 29. 1991 as scheduled, with a total assignment of four month to be executed.

Upon his arrival at the SEAPRODEX factory the QCE noted that the equipment purchased from NISSUI had been delivered and was placed, in unopened boxes, inside the laboratory.

The following equipment was ordered:

Hand Can Tester, 0-2 kg/$cm^2$
Vacuum Can Tester, 0-76 cm Hg
Micro Meter, 0-13 mm.
Flat Saw & J.G. Saw
Slide Calliper
Seam Slitting Saw, Waco.
Can Opener
Automatic Incubator, ISUZU
F-Value Microcomputer, HISAKA
Refractometer, ATAGO
pH-meter, HORIBA
pH-meter, portable, HORIBA
Salinometer, HORIBA
Electronic Thermometer, YOKOGAWA
Scale, analysis, AND
Scale, technical, SHIMADZU
Distillation Unit, ISUZU
Refrigerator, TOSHIBA
Soxhlet, SIBATA
Water Bath, SIBATA
Water Bath, YAMATO
TVN analysis equipment, SIBATA
Centrifuge, SAKUMA
Cromatograph, HITACHI
HPLC, HITACHI
Autoclave, HIRAYAMA
Stomacher, COLWORTH
EC-Broth, NISSUI
Standard Method Agar, NISSUI
TGC Medium, Fluid, NISSUI
Desoxycholate Agar, NISSUI

Checking the goods delivered, against the packing lists revealed the following shortcomings and defects:

Missing:

* Manuals for Fat analysis using Soxhlet method.
* Manuals for Histamine analysis.
* Chemicals for Histamine analysis.

Defects:

* Salinometer, digital, was broken at the on/off switch.
* Moisture-meter, automatic, was not working according to the specification.
* Balance for chemicals out of function.
* Two burettes for VBN determination were broken.
* One incubator malfunctioning, could not maintain constant temperature.

Due to the tight time schedule it was not possible to return all the defect equipment to NISSUI, and repair of all items, except the automatic moisture meter, was, therefore, carried out locally. The moisture meter had to be returned to NISSUI as no specialist could be found in Viet Nam.

The missing manuals arrived on May 13. while the moisture meter had not been returned, in spite of several telexes and telefaxes, at the departure of the QCE on May 29, 1991.

The physical environment for the laboratory were generally satisfactory and the equipment, instruments and auxiliary facilities could be installed and used with only minor changes to the rooms and existing facilities. The following changes were made:

## 1.1 Preparation Room.

The room was fitted out for preparatory work, such as preparation of samples and reagents, sterilization of glassware, destruction of used material and storage of chemicals and growth media.

As many of the components used for microbiological analysis are considered either poisonous or hazardous, it was decided to install new cupboards and refrigerators, which could be securely locked, for storage of chemicals and media. At the same time a card file for registration of the content in the storage cupboards were established.

The autoclaves for sterilization, preparation of growth medias and destruction of used material were installed in the preparation room.

## 1.2 Microbiological Laboratory.

A partition was installed which divided the room in two: One for preparation of the samples, incubation and as general working area, and a second sterile room for the actual analytical work.

In order to avoid, to the greatest extent possible, contamination which could lead to erroneous results, it was decided to replace the existing tile tables with stainless steel tables, as such tables would facilitate cleaning and allow use of strong detergents and alcohol for sterilization.

The existing ethanol burners were replaced with the more efficient Bunsen burners for sterilization of the samples.

The stomacher for mixing of the samples and the water bath for stabilizing optimal temperatures of the media, were installed in the sterile room.

## 1.3 Chemical Laboratory.

The analysis performed in the chemical laboratory often involves work with solvents which are considered hazardous to health. Consequently it was decided to construct an extra partition thereby creating a room for a fume cupboard with efficient ventilation in order to protect the staff against hazardous fumes.

New tables were installed in order to create sufficient space for all the new equipment to be installed in such a way, that all units can be used at the same time, if necessary, without moving equipment around.

New water pipes were established to supply the laboratory with water, as cooling water is necessary for the SOXHLET analysis.

## 1.4 Organoleptic laboratory and test kitchen.

New tables for physical inspection of the samples were installed together with hotplates for production of new recipes and test meals for organoleptic evaluation.

## 1.5 Test-run.

Full test-runs were performed in accordance with the specifications from the supplier for all available equipment. The delivered equipment was found to operate satisfactory.

## 2. Conclusion.

The room structure and the set-up of the equipment is adapted to accommodate the requirements of the International Standards for a Quality Control Laboratory in a food processing factory. Special effort has been made to secure safety of the staff in connection with electrical installations, ventilation and storage of hazardous material.

The lack of prompt action, in spite of several telexes and telefaxes, from NISSUI regarding the manuals and repair of the moisture meter obstructed the completion of the laboratory as a fully operational unit, and commissioning could, therefore, not take place during the assignment of the QCE.

Detailed instruction for the installation of the moisture meter was given in order to make installation possible without supervision from the QCE.

## 3. On-the-job Training and experiments.

Most of the equipment purchased and many of the methods used for analysis were totally new to the SEAPRODEX staff and it was, therefore, decided to arrange the training program in such a way that the required standards from the preferred export markets, USA and Europe, could be complied with

In order to achieve this goal, manuals prepared by Nordic Committee on Foodanalysis were procured. Using No. 96, 1980 "Bacteriological examination of fresh and frozen fish and fish products" as a benchmark the following training program was agreed upon:

* Total Bacterial Count (TPC): Determination in meat and meat products which have not been cured smoked or similarly treated (NMKL 86, 1986).
* Determination of Staphylococcus aureus in foods (NMKL 66, 1980).
* Salmonella bacteria. Detection in foods (NMKL 71, 1985).
* Vibrio parahaemolyticus. Detection in foods (NMKL 97, 1982).
* Pretreatment of solid food for microbiological examination (deep infected and surface infected), (NMKL 91, 1988).
* Psychrotrophic microorganisms. Determination by the plate count method (NMKL 74, 1989).

* Histamine. Determination in fish (NMKL 99, 1981).

* Determination of faecal Streptococci in foods (NMKL 68, 1978)

Additionally instruction in the application of the Conway standard method was given for determination of Total Volatile Nitrogen (TVN) and instruction in the use of the SOXHLET standard method was given for fat determination.

The training was carried out as a combined program, with theoretical morning classes for all staff members of the laboratory and practical on-the-job training in the afternoon.

During the morning classes the use and maintenance of each peace of equipment was demonstrated while going through the procedures of the analyses. In the afternoon the staff were allowed to use the equipment for hands-on experience in executing the tests.

Some of the subjects specially emphasised during the training program were:

* pH-measurement

* Determination of Moisture Content.

* Determination of Fat Content (Soxhlet, Bligh & Digher)

* VBN (Conway method)

* Salinity determination

* Determination of Free Fatty Acid (FFA)

After each staff member had been going through each analysis in detail, the program was changed to on-the-job training where each member of the staff performed practical analysis using different raw materials and finished products such as tuna, shrimp, whitefish, mussels, squid, etc, in order to familiarize themselves with the routines commonly used for the different types of material.

In order to develop a new product it is necessary to gather information in the primary market for the product, regarding specific quality standards, regulations for additives allowed in food, special "taste", product specification and labelling, etc.

Several theoretical examples were given in the class room. As practical training it was decided to use a mix of raw material, consisting of 40 percent shrimp, 30 percent mussel, and 30 percent squid, in a "Seafood Cocktail".

For further information on the progress of the practical work see: CTA report "Production experimentation".

As a conclusion to each set of experiments the staff should carry out organoleptic tests of the new product and it was demonstrated how the results of these tests, in combination with the results of the microbiological tests, could be used to determine the final standards for a new product.

By these experiments it was made clear to the laboratory staff that development of production standards for a new product usually is a complicated process which requires experience, skill and days of hard work in order to secure successful introduction of the product to the more demanding markets.

## 4. Development and Service Works Programme

Service manuals for the purchased equipment was provided from the supplier and during the training programme the staff was instructed in the proper maintenance and service of the equipment.

Further development of the laboratory facilities were discussed with the key personnel during test-runs with different types of material and during experimental development of new products.

The laboratory at SEAPRODEX Plant No. 2 is, at present, equipped specially for development of new canned product and training in development procedures for other types of product was, therefore, limited to full theoretical training and practical training to the extent the available equipment allowed.

## 5. Programme for study tours and fellowships

The following outline for a Training Program for four team managers and eight senior staff specialists was prepared:

### 5.1 Fellowships:

Four three month fellowships for team managers. The fellowships should be offered in North America or in the EEC, as these markets are the preferred targets for Vietnamese sea-food export.

It was decided to suggest that the four fellowships were divided into two categories: Two fellowships for participants who should preferably be university graduates in food technology, and two fellowships for participants with a degree in biochemistry.

The primary topics for the fellowships should be:

5.1.1 Food technologists.

* International standards and codes of practice for fish and fishery products.

* Buyer's specifications of seafood, sampling and analytical procedures to comply with buyer's specifications.

* Organization of fish inspection services and implementation of fish inspection at government level.

* Quality assessment, organoleptic methodology.

* Final random inspection.

* Lot identification.

* Sampling methods.

* Sample examination.

5.1.2 Biochemists.

* New sanitary regulations in major importing countries.

* Plant sanitation and hygiene organization of plant quality control unit.

* Physical, chemical and microbiological testing methods for fish and fishery products.

* Design and operational features of instruments used for physical, chemical and microbiological analysis; interpretation of results.

* Analyzing methods for, and interpretation of results of:

    1. Physical: pH and moisture.

    2. Chemical: TVBN, Indol, Histamine, NaCl, Sulphur Dioxide, Polyphosphate, Mercury, Lead, etc.

    3. Bacteriological: Aerobic Plate Count, coliformes, Escherichia coli, Salmonella, Shigella, Staphylococcus aureus, Vibrio and Cholera.

It was decided to recommend that the fellowships took place in Denmark and SEAPRODEX, therefore, asked R & H International to inquire to DANIDA whether Danish financing for the fellowships were possible.

In addition to the four fellowships it was decided to suggest study tours for eight senior specialists to Tinsulanonda Songkhla Fishery College, Thailand

It is recommended that SEAPRODEX, through the Vietnamese Government, applies for funding of the necessary quality control training program in Denmark, and that UNIDO should be addressed for the financing of the training program for the senior specialists.

## 6. Training in QC, fish processing and maintenance of plant equipment

The flesh of fresh, undamaged fish without wounds is generally considered sterile, or at least free from pathogens. Pathogene bacteria are picked up during handling and processing, which is why cleanliness, hygiene and sanitation at all stages are so important.

The following points, which helps reducing contamination, are applicable to the food industry in general but were considered worth reiterating in relation to the sea-food production at SEAPRODEX Plant No. 2, as it should be adhered to in all fish processing plants:

* Proper construction of premises, equipment and drains.
* Provision of adequate ventilation.
* Provision for prompt removal of offal and refuse.
* Regular, supervised cleaning and sanitation programs.
* Protection against rodents, insects and birds.
* Supervised attention to personal hygiene.
* Provision of pleasant, clean toilet facilities.
* Provision of a regularly replenished supply of clean protective clothing and insistence on its use.
* Proscription on eating, smoking and spitting.
* Attention to cuts and abrasions.
* Separation of wet processing from dry packing areas.

This list is not exhaustive and several of these points are covered by local food hygiene regulations that apply to fish and fish products.

It is, though, of utmost importance that these points are complied with and,therefore, four senior laboratory staff members and four senior staff members from processing were trained in routines for hygiene control of the processing area.

Additionally they were trained in giving information and motivation to the other staff members and senior staff from other industries regarding maintenance of high sanitary standards in a modern factory producing sea-food products for export. (see Annex I)

The training consisted of:

1. Visual evaluation. This inspection should be carried out several times during each working period.

The inspection should include but not be limited to:

General appearance of the working area: Is it clean? Are there many insects? Is the air clean and without bad odour? Are the offal containers emptied and clean? Is the floor properly clean? Are the walls clean? Is the processing equipment clean? Do the staff adhere to the dress code? Are the niforms clean? Are other regulations imposed by the management adhered to?

2. Microbiological examination. The inspection should take place at least three times per day: 1. Before start of production; 2. One inspection during production; 3. After the mandatory cleaning procedures at the end of a production period.

<u>Procedure:</u>

A microbiological sample is collected by sweeping a 10 $cm^2$ surface with a sterile swap stick. The material is spread on different growing media and placed in an incubator at 35 to 37 deg. C.

After the growing period the samples are checked for pathogene bacteria.

Since such microbiological assessments take many hours to complete, instantaneous or even very rapid action can not be taken on the results. Never the less as means of motivation for the entire staff to strengthen "the first line of defence": Continuous cleaning and maintenance of high hygienic and sanitation standards, microbiological testing of the production area has proved to be second to none.

**7. Training of personnel from other plants.**

The planned training of staff from other processing plants outside SEAPRODEX Plant No.2 was inhibited by the late arrival of manuals and equipment from NISSUI. As an alternative it was decided by the management and QCE to intensify the training of the eight senior staff members to a level as trainers who could be instrumental in bringing about the required out-of-house training.

As the training at the SEAPRODEX Plant No. 2, to a large degree, has been concentrated on quality control of canned products, the importance of the fellowships for the eight senior staff members should be emphasised in order to provide proper knowledge about other product types and, particularly, new product development.

**8. Applied research activities.**

As mentioned under 3. above an in depth research and development program was executed for a seafood cocktail, involving production of shrimps, mussels and squid.

During the development of the seafood cocktail normal routines and procedures for applied research in connection with new product development was practised.

**9. Work programmes for other industries.**

During the QCE assignment it was strongly emphasised that all operations, procedures and routines should be formalized and documented not only for the laboratory, but also for the production and the products.

A complete set of documentation for SEAPRODEX Plant No. 2 was prepared and made available to other industries. (See Annex II-VII)

**10. Assistance to the other industries.**

National Quality Control Laboratories are located in Hanoi and in Ho Chi Minh City. The main purpose of these laboratories is to issue certificates for products to be exported.

The Hanoi laboratory has received considerable financial support from UNIDO. In an effort to obtain funds for a similar upgrading of the Ho Chi Minh City laboratory the UNIDO representative, the BO , was invited to visit the laboratory together with the QCE.

The prepared budget for the upgrading of the laboratory, including an expatriate expert for installation and running in of the laboratory, was USD 250,000.-, for which amount the management planed to apply to UNIDO.

Asked for opinion the QCE mentioned that the budget seemed to be on the safe side, it should be possible to make the upgrade at least 20 percent cheaper if the equipment is purchased after an open tender.

The BO indicated a positive attitude towards finding funds to upgrade the Ho Chi Minh City laboratory to the same standard as the Hanoi laboratory.

**11. Define, regulate and enforce national norms.**

The training programme in general, and for the senior staff in particular, has been designed with special emphasis on definition and documentation of norms and standards.

The staff has received in-depth theoretical and practical training in the methodology to be used for establishment of standards and norms for the sea-food industry.

The existing national norms was used as a starting point for the training, and during the training period the norms and standards were regulated to comply with international specifications.

It was considered inappropriate to try to establish a national enforcement policy for the norms and standards established during the assignment of the QCE. The enforcement policy is purely political and should, therefore, be based on decisions made by the Government.

## 12. Preparation of Standards.

A Specification is a document that exactly and clearly describes need, purpose and demand for a product to all parties involved in the Quality Control functions of the company.

The Product Specifications should be considered a law of the company.

The Product Specifications summarizes demands from:

* Authorities
* Customers
* Company

The specification system will inevitably vary from one company to the other, but basically it should always contain:

* Fundamental Specifications (see Annex III)
* Product Specifications.
* Raw Material Specifications.
* Process Specifications.

All employees of the Company should be informed about the specifications and their content, particularly regarding:

* Raw Material quality demand.
* Process Volume.
* Employees responsibility.

The laboratory staff were trained in preparation of the following specifications and in performing routines to secure that the specifications were adhered to:

| | |
|---|---|
| PLANNED QUALITY: | 1.: Fundamental Specification |
| NEW PRODUCT DEVELOPMENT: | 2.: Process Specification |
| | 3.: Packing Specification |
| | 4.: Raw material Specification |
| | 5.: Product Specification |

| | |
|---|---|
| PRODUCTION: | 6.: Production Specification |
| | 7.: Control Specification |
| | 8.: Hygiene Specification |
| | 9.: Laboratory Specification |
| DELIVERED QUALITY: | 10.: Sales & Delivery Specification |

Fundamental Specifications describes the basic demands for a product.

Raw Material Specifications contains a description of all requirements for raw material quality.

Product specifications contains all raw material- and product specific demands to satisfy in order to comply with the Fundamental Specification.

Process Specification contains a description of specific demands to each operation the raw material have to go through in order to end as a product that complies with the Product Specification.

Based on the specifications the Company is able to:

- Control quality of raw material delivered to the Company and reject any raw material which does not comply with the Raw Material Specification.
- Make necessary and sufficient "in process" control of the product in order to secure that the final product comply with the Product Specification.
- Make final Quality Control of the Product and issue Quality Certificate to Customers and Authorities.The main strategy in establishing the list of priorities was to finish all necessary tasks in order to make the facility ready for installation of the production machinery and equipment when it arrived from Denmark.

For examples see Annex II to VII.

## CONCLUSION.

The tasks of the QC specialist have been concluded, with only the following few constraints and exceptions:

The manager of the quality control laboratory was only temporarily assigned and did not intend to accept the position on a permanent basis. This organizational disorder did create managerial problems during the training period.

In spite of several telex reminders to NISSUI the manual and chemicals necessary for Histamine analysis did only arrive on site on May 13., making it impossible to complete the training program for this type of analysis before the end of the assignment of the QCE.

It was noted that very sophisticated equipment was purchased for determination of Histamine content. The price for this equipment amounted to USD 25,000, which is more than 25 percent of the total laboratory budget.

Taken into consideration the original design of the laboratory as a routine testing facility, which should be able to carry out simple, quick and accurate quality tests, this equipment seems exaggerated.

As the local staff does not have the proper skill to operate this equipment in a satisfactory manner, and as it is impossible to get spare-parts for such high-tech equipment in Viet Nam, it would have seemed more appropriate to purchase ordinary routine testing equipment. The price of this type of equipment should not have exceeded USD 5,000.

Furthermore, future training programmes for QC staff from other factories is planned to take place in the SEAPRODEX laboratory, but as the other factories most probably do not have funds to purchase high-tech equipment for histamine testing the visiting staff will most probably not be able to make Histamine determination in the factories where they work.

It would have been more appropriate to spend more money on automatic equipment for determination of VBN to check the product at any stage through processing and in this way be able to adjust each operation in order to secure a better finished product.

## RECOMMENDATIONS.

In order to secure the success of the project it should be recommended to send the permanent QC staff to Europe for further training in requirements and working methods at the same time the staff would be trained in Histamine analysis using chromatography.

Additionally, it is recommended to send a QC specialist to Viet Nam after approximately six month of operation of the factory, to control that the prescribed procedures are adhered to and to solve problems that might have occurred during full capacity processing.

## ANNEX I. **Sanitary Control, Fish Processing Industry.**

Background:

In order to be able to supply sea-food products to specific markets it is necessary to comply with the quality requirements of such markets.

High product quality can only be obtained through establishment of a set of sanitary procedures both for each operation in the production process and for cleaning and maintaining the factory.

Likewise, it is necessary to establish a set of requirements for personal hygiene to be demanded of the staff and to enforce the fulfilment of such requirements.

It is evident that high quality demand to the product requires a high level of hygiene in the factory, which again increases the expenses to be incurred in order to obtain and maintain the requested level.

It is, therefore, of utmost importance that the management in the strategic plan specify the priority markets and their quality demands.

When the priority markets and their demands have been described it should be possible for the QC staff to determine the level of hygiene necessary in the plant and, hence, for the economists to estimate the expenses of maintaining such a level.

Following the sanitary procedures meticulously will enable the factory to issue product certificates, guaranteeing a healthy product with a constantly low content of foreign objects and microorganisms.

Such certificates, which are already demanded by most buyers in the developed world, will almost inevitably lead to other, new customers wanting to buy the products and thereby reduce the marketing cost with an amount that, in many cases, exceeds the additional cost of cleaning and maintaining good sanitary standards.

Good sanitary practices are rewarded not only by easy marketing but also by increased prices obtained for the product, and reduced loss due to rejection of product by Health Authorities or customers.

This document is prepared in order to give a brief outline for common rules and procedures regarding establishment and maintenance of sanitary standards in SEAPRODEX Factory No. 2.

The management should elaborate a comprehensive set of rules and standards specifically for Factory No. 2 before start of commercial production.

The rules and regulations should be made in such a way that they easily can be altered to suit specific situations that might occur during commercial production.

## Cleaning and hygiene.

The organization has to take all reasonable measurements and arrangements to secure the following:

a: Disease control:

Nobody who has a contagious disease, abscess, sore, infected wounds or anything else that can contribute to microbiological infection of the product, are allowed to work with foodstuff, ingredients or any other material that gets in direct contact with foodstuff.

b: Personal hygiene:

All personnel has to, when they are working in direct contact with foodstuff, ingredients or other items which are in direct contact with foodstuff:

1. Wear clean clothing, keep high personal hygiene and work in such a way that contamination of the foodstuff are prevented.

2. Clean their hands properly (and if necessary sterilize) before the work starts, and each time they leave the working area, and at any other time where the hands could be contaminated.

3. Remove all rings, jewellery from hands which can not be sterilized in a proper way.

4. If gloves are used during preparation of foodstuff, these have to be intact, clean and in good hygienic condition, Gloves should be made of non permeable material.

5. Use hairnets, caps or other protection to keep the hair fully covered.

6. Refrain from keeping personal items, eating food, drinking or smoking in areas where foodstuff is prepared or in storage areas for ingredients, packing material or material for cleaning.

7. Make all necessary arrangements to avoid contamination, i.a. by transpiration, cosmetic, tobacco, chemicals, medicine, etc.

c. Cleaning Procedures.

1. The factory should have a permanent staff who are only responsible for cleaning

2. The floor area should be kept clean during production and offal should be removed from the processing area continuously.

3. All surfaces which are in direct contact with raw material or products during processing should be sterilized between each shift and at the end of a working period. Only approved materials and chemicals should be used for sterilizing.

4. All surfaces in the processing area such as floor, walls and ceiling should be properly hosed down at the end of a working period.

5. The floor drain should be kept clean at all times and treated with approved disinfecting agents at the end of each working period.

6. Aside from the daily cleaning routines the processing area should undergo a weekly in depth clean-up.

d. Control.

The person in charge of the daily control of the hygiene in the factory should preferably have at least a college degree in food science, including microbiology and chemistry, and experience from a QC laboratory.

He should report directly to the management. The management should give him power to enforce the sanitary rules and regulations in the factory at all levels.

He should be authorized to exclude any person with abscesses, infected wounds etc., or who does not comply with the regulations for personal hygiene from participating in the production.

He should be responsible for information and motivation of the staff regarding hygiene and sanitary procedures.

## ANNEX II. FUNDAMENTAL SPECIFICATIONS.

(example)

Main purpose: Production of white fish fillets for Customer XX Ltd. from Russian caught fish size YY.

Description: The following demands must be complied with:

1. Time from catch to delivery to the factory shall not exceed 48 hours.

2. Transportation time from ship to factory shall not exceed 12 hours.

3. Storage time in factory chill store shall not exceed 48 hours.

4. Temperature in the raw material shall at all times during transportation and storage be kept as close to 0 C° as possible and must never exceed 1 C°

5. Total processing time must not exceed 4 hours.

6. The temperature during processing shall be kept as close to 0 C° as possible and must never exceed 7 C°

7. The finished fillets shall be placed in chill store and cooled to < 1 C° in less than 2 hours after processing.

8. The time in chill store before delivery to the customer must not exceed 20 hours.

9. The temperature of the fillets when delivered to the customer must not exceed 1 C°.

Limitations: To comply with Customers demand, the quality loss should not exceed 30 percent from catch to delivery to the customer.

Remarks: The Customers demands requires establishment of new routines for time/temperature registration. New specifications should be made.

## ANNEX III. RAW MATERIAL SPECIFICATION.

(example)

| | |
|---|---|
| Product: | White fish fillets, size YY for Customer XX. |
| Delivered by: | SEAPRODEX |
| Maximum age: | Raw Material: 2 days from catch. |
| Organoleptic: | >7 |
| Packing: | Plastic boxes with drain. |
| Icing: | 1:1, (Raw Material/Ice) |
| Transport: | Only refrigerated trucks. Maximum transport time: 12 hours. |
| Temperature: | < 1 C° |
| Marking: | Each box shall be marked with: Name of the buyer, date, time of catch. |
| Storage: | According to instructions from chill store supervisor. |

## ANNEX IV CHEMICAL SPECIFICATION

(example)

**Product:** Blue Whiting, fillet, skin-on.

**Purpose:** Determine level of freshness.

**Analysis:** TVN (Total Volatile Nitrogen)

**Reference:** Conway, E.J.Byrne, 1933: "An absorption Apparatus for the Microdetermination of certain substances."

**Appliances:**

* Beaker, 250 ml
* Thermometer, 110 °C
* Graduated glass, 100 ml
* Ph meter
* Moisture balance
* Funnel
* Filter paper
* Erlenmayerflasks, 150 - 250 ml
* Pipettes, 1 - 2 ml
* Conway set
* Burette, 3 ml.

**Reagents:** HCl app. 2.0 Standard solution: 165 ml conc. HCl is diluted in distilled water to 1000 ml.

HCl app. 0.025 Standard solution: 250 ml 0.1 Standard solution is diluted in distilled water to 1000 ml.

$K_2CO_3$: 112 g $K_2CO_3$ is dissolved in 100 ml distilled water.

NaOH app. 0.025 Standard solution: 250 ml 0.1 Standard solution NaOH is diluted in distilled water to 1000 ml.

A.C.Andersen indicator: 0.05 g methylene blue and 0.1 g methylene red is dissolved in 100 ml ethanol

Petroleum jelly

**Operation:** The sample is crushed and blended thoroughly. 25 g of the pulp is transferred to a beaker and mixed with 75 ml distilled water.

pH is lowered to 5.2 using 2N HCl. The adjustment is made in order to denature the proteins and make filtration easier.

The sample is heated to 70 °C.

The sample is cooled to room temperature.

The sample is filtrated through filtration paper.

2 ml of the filtrate is interjected in the outer ring of the Conway dish.

2 ml 0.025N HCl is interjected in the inner ring of the Conway dish.

1 ml $K_2CO_3$ is added to the filtrate in the outer ring of the Conway dish. The Conway dish is immediately covered with a lid using petroleum jelly as seal.

The Conway dish is rotated slowly to mix the sample.

After 4 to 20 hours incubation time the lid is removed and A.C.Andersen indicator is added to the inner ring.

The liquid in the inner ring is titrated using 0.025 Standard solution NaOH until the colour changes from violet to greenish blue.

Blank test is made.

Calculations:

$$\text{mg N/100g} = \frac{(\text{ml HCl} - \text{ml NaOH} * f) * C * 14 * Z * 100}{2 * g}$$

C = Concentration of HCl
f = Ratio HCl/NaOH
Z = Dry matter in sample
g = Weight of sample
14 = Atomic weight of Nitrogen.

## ANNEX V. MICROBIOLOGY SPECIFICATION.

(example).

**Product:** Canned Tuna in Oil.

**Purpose:** To identify the freshness of the fish.

**Standards:**

| | | |
|---|---|---|
| Total Plate Count: | < | 500,000 bac./g |
| Faecal Streptococci: | < | 100 bac./g |
| Staphylococcus aureus | < | 100 bac./g |
| Coliforme bacteria | < | 100 bac./g |

**References:**

| | |
|---|---|
| Total Plate Count | NMKL 86, 1972 app. 1 |
| Faecal Streptococci | NMKL 68, 1978 app. 2 |
| Staphylococcus aureus | NMKL 66, 1980 app. 3 |
| Coliforme bacteria | NMKL 62 |

## ANNEX VI . PROCESS SPECIFICATION.

(example)

Hand filleting.

| | |
|---|---|
| Control locations: | Before processing: Check knives and tables (clean, sharp, etc.). Give correct instruction for cutting the fillets, excluding V-cut. |
| Inspection: | Each hour: Yield from each operator. Temperature. Correct if not optimal.<br>Each hour: Quality test. Correct if not within limits of Product Specification. |
| Equipment: | Scale, thermometer, visual judgement. |
| Registration: | Erroneous, or non-optimal operations shall be reported to QC in charge. |

## ANNEX VII. CERTIFICATE FOR SEAPRODEX PRODUCTS.

| | | | |
|---|---|---|---|
| Date | : 08 02 91 | Time of Control: | 13.50 |
| Product | : Frozen Fish | Name of QC | : B.A. |

**MICROBIOLOGICAL TEST:**

| | | |
|---|---|---|
| TPC (48 h at 37°C) | < | 500,000 bac/g |
| Faecal coli (LST-bouillon) | < | 50 bac/g |
| Faecal Streptococcus | < | 100 bac/g |
| Coliforme bac. | < | 100 bac/g |
| Staphylococcus | < | 100 bac/g |
| Clostridia | < | 10 bac/g |

**CHEMICAL TEST:**

| | | |
|---|---|---|
| VBN | < | 25 mg VBN/100 g |
| TMA-O | < | 6 mg TMA-N/100 g |

Signature:

## ANNEX VIII. LETTER TO DANIDA.

DANIDA
Asiatisk Plads 2
1148 Copenhagen K.

91.06.19
bel

Att.: Mr. Lars Elle, S.6

Dear Sir,

Re: Project: Establishment of Canning Line and Quality Control Laboratory Seaprodex Plant no 2, Financed by Unido and UNDP.
Activity: Training Programme in Denmark for 4 Vietnamese Quality Control Technicians.
Purpose: Financial Assistance for the Training Programme

Seaprodex is today a public holding company that is responsible for the export of marine based products. Seaprodex further controls a number of important fish processing industries including Plant no. 2 located in Ho Chi Minh City. Aside from a production of its own Plant no. 2 is selected to be a model unit also to be used for demonstration and training purposes.

Rambøll & Hannemann (R&H) has been consultants to Unido on the above project and has carried out the following activities:

1 Preliminary design in 1988,
2 Visiting and training tour to Denmark in 1989 for 4 representatives of Seaprodex. The tour aimed at introducing modern processing equipment and related technology.
3 Detailed design, tender documents and tender evaluation for the canning line and quality control facilities at Plant no. 2 in 1990.
4 Technical assistance, procurement and supervision of installation of the canning line and the quality control laboratory. On-the-job training in fish processing and Quality Control (QC) of Vietnamese counterparts.

As a part of activity 4 the implementation plan includes a training tour to South-East Asian countries and Japan for 4 Vietnamese QC Technicians. However, it has been decided that the training tour in stead should be carried out in Europe, preferably, Denmark.

Due to financial constraints caused by a declining US Dollar R&H hereby asks Danida to consider a financial assistance for the QC training component to be carried out in Denmark (the funds needed for the financing of minor remaining equipments and further Technical Assistance will be sought through UNDP as agreed on a Tri-Partite Meeting held on May 13, 1991, in Vietnam).

An outline of the content of the Training Programme is presented below furnished with a budget.

**Training Programme for 4 Vietnamese Quality Control (QC) technicians in Denmark**

**Purpose:**
To train 4 QC technicians in modern methods of analysis. After completed training the trainees will be able to carry out all necessary chemical and bacteriologic tests needed at factory level using modern test equipment and methods. They will be closely acquainted with product standard requirements and hygienic production practices and will be furnished with necessary documentation for products standards and methods of analysis. The trainees will also be able to manage day to day operation of QC laboratories and practices and to act as trainers at factory level.

**The Trainees:**
The trainees do have a formal background in laboratory technology corresponding to at least laboratory assistant level in Denmark. They have further received on-the-job training in Vietnam during the installation of equipments and laboratory guided by the R&H QC Specialist. The CVs of the 4 selected trainees are attached.

**Programme Outline:**
There programme is composed of 3 major activities.

1. Formal training at the Esbjerg Technical School (referred to as the School) and the Højmark Laboratory, 70 km from Esbjerg (referred to as the Laboratory).

   The following subjects will be included in the formal training:

   - microbiology (total plate counting, coliform bacteria, e. coli, staphylococcus, streptococcus, salmonella, and clostridium botulinum),

   - chemical analyses (TVN-test according to the Conway and Struers (automatic) methods, fat content according to the Soxhlet method, histamine chromatography, and salt concentration analyses),

- import standards of Denmark and the EEC (concerning the acceptable levels of bacteria and chemical compounds in the different products and hygienic production requirements),

- general routine work and behaviour in a laboratory following Danish practice,

- quality control aspects (raw material control (organoleptics), in-process control, hygiene control, certification)

2. The trainees will visit a number of Danish processing plants to follow the actual exercise of QC-practices. The proposed plants are:

- PLM Haunstrup, Odense (can production and QC of seeming),

- Esbjerg Seafood, Esbjerg (shrimp production),

- Rahbek Fish, Fredericia, (ready to cook dishes),

- Marina, Nørre Sundby, (canned products),

- Poul Agner, Esbjerg (white fish),

3. Important public agencies involved in different aspects of quality control will be visited:

- Fiskeriministeriets Forsøgslaboratorium, Lyngby,

- Industritilsynet, Fiskeriministeriet, København,

- the North Sea Centre, Hirtshals,

The total time requirement is estimated at 6 weeks. The formal training part of the programme will last 4 weeks and the tour of visits to the plants and public QC agencies will last 2 weeks. Commencement of formal training activities are scheduled to 5th. August 1991.

**Budget:**
The total financial requirements are estimated at:

**DKK 510,452 (USD 75,128)**

The budget is based on actual prices (a detailed budget is attached).

In order to assure continuity and coherency of the overall QC training programme (on-the-job training in Vietnam and the training in Denmark), R&H propose to make optimal use R&H QC

Specialist from the TA assignment in Vietnam, mr. Bent Skaarup Andreasen (the full CV is attached). Mr. Andreasen will act as R&H Group Leader during the tour of visits to public authorities and processing plants. He is further included in the formal training program at the School and Laboratory as instructor.

The tuition fee of the School and the Laboratory is based on an offer from these institutions. The offer follows the regulations laid down by central authorities. The price per hour, DKK 1.000, is calculated per effective teaching hour and includes time for preparation by the instructors. A total of 150 training hours is needed.

A car will be rented for transportation in Denmark, to be used under the study tour, but also to and from the accommodation in Højmark to the School in Esbjerg (a distance of 70 km).

Yours faithfully,
Rambøll & Hannemann

Bent Larsen
Head of Fisheries Department

Enclosures

TRAINING OF 4 SEAPRODEX QUALITY CONTROL TECHNOLOGISTS

BUDGET

| | Unit | No of Units | Price (DKK) | Total (DKK) | Total (USD) |
|---|---|---|---|---|---|
| A. INTERNATIONAL TRAVEL | | | | | |
| HCM-Esbjerg (DK)-HCM | piece | 4 | 13,460 | 53,840 | 7,918 |
| B. ACCOMMODATION & ALLOWANCES | | | | | |
| School & Laboratory 1) | | | | | |
| - 4 Vietnamese Trainees | nights | 112 | 250 | 28,000 | 4,118 |
| Study Tour | | | | | |
| - 4 Vietnamese Trainees | nights | 52 | 500 | 26,000 | 3,824 |
| - R&H Group Leader | nights | 13 | 500 | 6,500 | 956 |
| Allowances | | | | | |
| - 4 Vietnamese Trainees | days | 160 | 224 | 35,896 | 5,279 |
| - R&H QC specialist at School & Laboratory 2) | days | 5 | 74 | 370 | 54 |
| - R&H Group Leader during Study Tour 3) | days | 14 | 224 | 3,141 | 462 |
| Sub-total B | | | | 99,907 | 14,692 |
| C. TRANSPORT IN DENMARK | LS | 1 | 20,000 | 20,000 | 2,941 |
| D. TUITION FEES | | | | | |
| School & laboratory 4) | hours | 150 | 1,000 | 150,000 | 22,059 |
| E. TRAINING MATERIALS | | | | | |
| Training materials 5) | set | 4 | 25,000 | 100,000 | 14,706 |
| Working clothes | set | 4 | 4,000 | 16,000 | 2,353 |
| Sub-total E | | | | 116,000 | 17,059 |
| F. PROJECT COORDINATION & MANAGEMENT 6) | hours | 127 | 560 | 71,120 | 10,459 |
| Total | | | | 510,867 | 75,128 |

Notes:
1) Esbjerg Technical School: 2 weeks, the Højmark Laboratory: 2 weeks.
2) The R&H QC Specialist has permanent address in Esbjerg and will only require 1/3 day allowances for 5 days at schools
3) The R&H Group Leader will accompany the trainees during the visits to factories and public authorities
4) The R&H QC Specialist will participate in the formal training.
5) Compendia, materials (raw material & chemicals) for exercises, development of reference materials.
6) The R&H Group Leader for 2 weeks (incl. 1 week-end), and a Project Coordinator for 1 week based at R&H, Brede.

Exchange rate: USD 1 = DKK 6.800

ANNEX IX

Project in the Socialist Republic of Viet Nam

**JOB DESCRIPTION**

DP/VIE/87/002/11-02/J 13103 (B. Andreasen)

| | |
|---|---|
| Post title: | Expert in fish testing and quality control |
| Duration: | 2nd phase - 4.0 man-months - 30 January to 29 May 1991 |
| Date required: | As soon as possible |
| Duty station: | Ho Chi Minh City, Viet Nam |
| Purpose of the project: | To increase the quality, quantity and variety of marine products processed by SEAPRODEX Plant No.2 and to disseminate fish/food processing technologies and quality control procedures gained through this project to other processing plants in Viet Nam |
| Duties: | the expert, in close cooperation with the Chief Technical Adviser, the National Project Director and the project administration, will specifically be expected to carry out the following duties: |

- Advise and assist in the final identification and specification of the laboratory equipment and instruments and related auxiliary facilities and in installation of the same;

- Assist and take part in the adjustment and test run of the laboratory and in the laboratory commission;

- Assist in conducting laboratory runs for experimentation and on-the-job training purposes and use of the laboratory for the production of new products under quality control;

- Assist in the preparation of development and services work programmes for the laboratory;

- Take part in the preparation of the programme for training through study tours and fellowships abroad of four team managers and eight senior specialists and technologists of the laboratory and production;

- Train eight senior staff members of Plant No.2 in quality control, fish processing and maintenance of the plant equipment;

- Assist in in-plant training of technical personnel from other fish processing plants in fish raw material quality control, sanitary and quality standards of fish processing and related testing/quality control techniques and in testing and quality control of new products;

- Take part in the preparation of work programmes and procedures of applied research activities of SEAPRODEX and assist in conducting research work on various products and development of new products;

- Prepare work programmes and procedures of services to be provided to other industries in quality control, testing and certification of fish products;

- Assist in servicing the industries in accordance with the programmes mentioned above in e.g. procedures on testing, analysis of products during the design phase, etc.;

- Define, regulate and enforce the national norms and quality standards of fish products;

- Prepare manuals describing the methodologies to be applied for the verification of compliance to the norms and standards as indicated in the activity immediately above.

The expert will also be expected to take part in the preparation of the terminal report, setting out the findings of his mission and recommendations to the Government on further action which might be taken.

Qualifications: High-level senior fish quality control expert, specialized in testing of raw material production inputs like water, production facilities and final products and familiar with international norms and standards of fish products.

Language: English, Vietnamese

Background information: Please see background information in the first job description of the CTA.

**PART IV JOINT TECHNICAL REPORT by Thai experts**

**A. 1st split mission - 6 days - 23 to 28 March 1992**

Damrong Sirakovit, Fish processing expert (trainer) - post DP/VIE/87/002/11-52
Parichet Prakarnkamanant, Fish quality control expert (trainer) - post 11-53

## 1. The Objectives

The subscribers, in cooperation with the National Project Director had carried out the following duties :

- Prepared a training programme for the project counterpart in the field of fish processing technology, maintenance and repair of technological equipment;

- Assist the application of knowledge gained during the fellowship training in Thailand to the projects fish processing operations :

- Evaluate the implemented programme in the field.

## 2. INTRODUCTION

The Fish Canning Project

The United Nations Development Programme and the United Nation Industrial Development Organization assisted in establishing a pilot plant at the Vietnam National Sea Products Export Corporation - Special Sea Products Import and Export Company (commonly known as SEASPIMEX or SEAPRODEX factory No. 2) located at 213 Hoa Binh Street, Tan Binh District, Ho Chi Minh City, Vietnam. This pilot plant was to serve both as a learning ground and an experimental centre to initiate a core of managers and engineers into technology and business concerned so that they could be given the responsibility of planning and implementing future investment of full scale industrial plants.

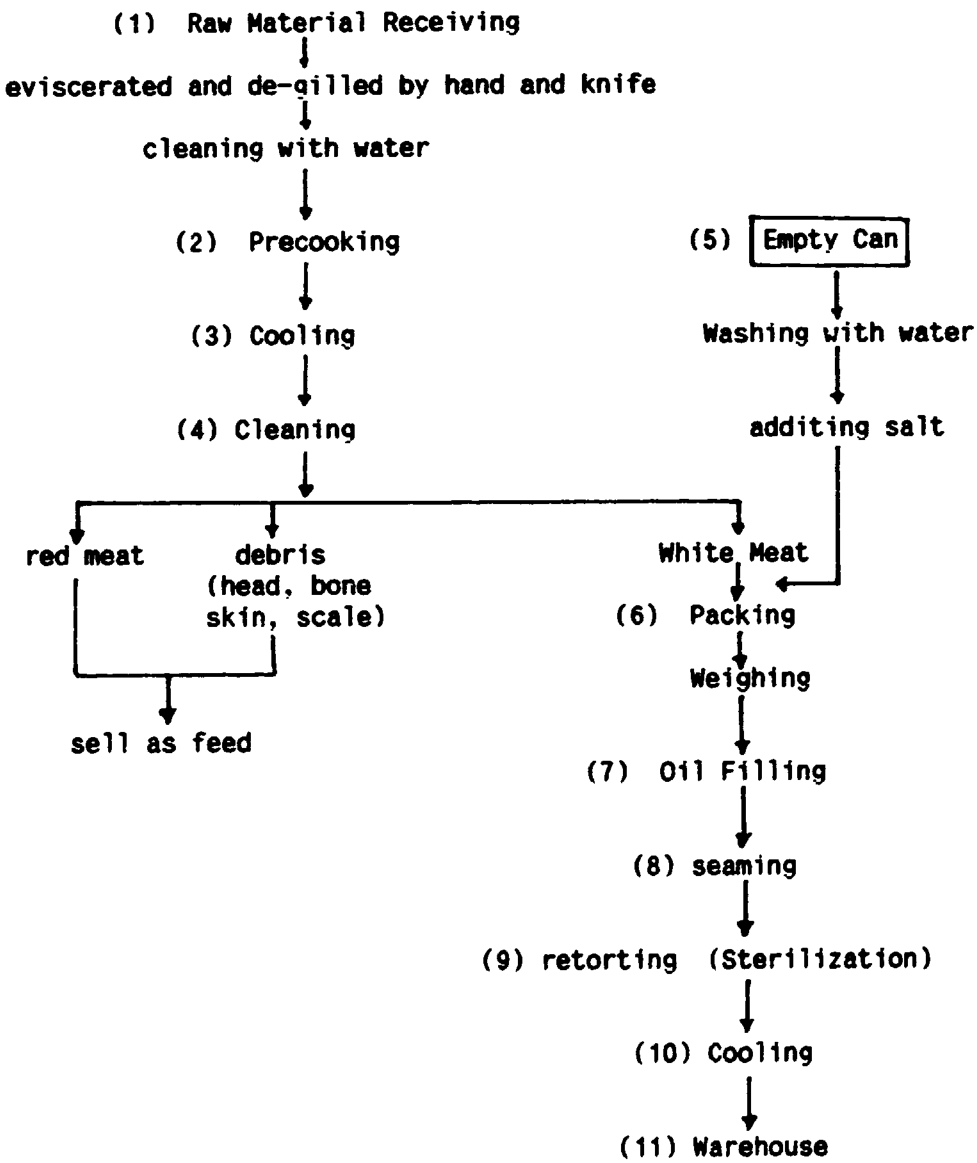
The inception of this project occurred during 1991. Most of the supervisory and key technical personnel needed by this project have been employed. The machinery and equipment have been installed, in fact some equipments were not suitable and incompleted which the subscribers will propose for correction at the later stage in this report.

The test run was conducted during 1991 which some products were produced during that period. The total 1899 samples were drawn for evaluation. Of those samples, 1277 were acceptable quality and 622 samples were rejected. This represented 37.75% inferior quality to the international standard. The result is shown in the Annex III.

The finding highlighted the need to improve the personnel knowledge in processing and quality control technology as well as completing the plant equipment.

## 3. THE WORK PROCESS FLOW

### A. Process Flow Chart



## B. Raw Material Receiving

**B.1 Source** Local catching

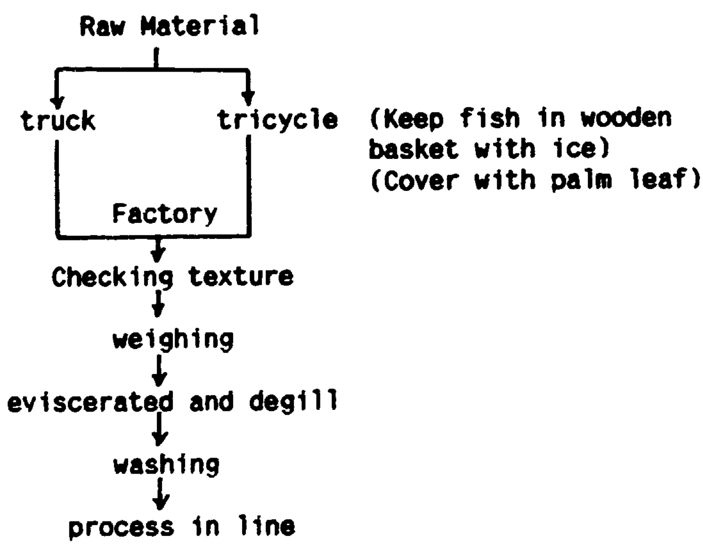
Size of R/M 0.8 - 1.5 Kg

1.5 Kg up

Species of tuna Euthynnus (Bonito) - biggest volume

Skipjack, Yellowfin, Tonggol } small volume

**B.2 Handling**



C. Precooking

- Control backbone temp - before precooking 7-10 C

  - after precooking 60-70 C

- Precook process 90-100 C/50-60 minutes
- Turn on steam in precooker 9.00 a.m. = start process ⎤
- Tuna reached 95 C at 9.05 a.m. ⎬ 60 min.
- Close steam at 10.00 a.m. ⎦
- Back bone temp after precooking 84, 87, 68, 84, 83, 75, 65, 61, 77 C

D. Cooling by spraying water ~ 1 hour until backbone temp 45 C (for urgent use, they spray only 10 minutes)

E. Packing

- Cut tuna loins into pieces by knife (wooden handle)
- Workers arrange fish pieces into empty can by hands after adding salt into empty cans.
- Weigh every can.
- Use flat surface stainless steel topper to press fish in can to get flat surface.
- Fill soya bean oil (heat to ~ 70 C before filling into can).

F. Seaming

Seaming machine : Somme (no steam flow or no vacuum)
one head 60 cans/minute

G. Retort (Sterization)

- fully automatic control with heat exchanger system
- Water cooking and cooling system

H. Post Retort Process

Post Retort Process - removing retored products from the retort and left at the processing area for natural cooling.

I. Warehouse

- Some cans were kept into cartons while some where piled without cartons.
- The cans without cartons were very dusty and some rusted at under seam.
- High ambient temperature (30-35 C) area.

## 4. The Existing Plant Layout and Proposed Additional Equipments

The existing pilot plant was almost completed. There are some missing equipments that after installed will enable this plant to serve as a learning ground and experimental centre. The proposed equipments are :

A. The Seaming Machine (reference No. 10 in existing plant layout - Annex III)

This seaming machine 'SOMME' was originally built to serve in the can making line. To use in the canning factory will need to modify the seaming head to allow the inflow of steam to be injected in can before closing stage in order to create vacuum in the container. (Annex IV)

B. Empty Can Washer

The current practice was done by individual can washing in the water tank by workers. This is deemed to be very inefficient. The proposed installation is shown in the annex III.

C. Tuna Cutting and filling machine

The current practice was done by manual filling by numbers of workers. This is deemed to be very inefficient as well as inferior quality. The proposed installation is shown in the annex III.

D. The Can Labeller

The current practice was done by labelling individual can by number of workers. This is deemed to be very inefficient a new labelling machine should be purchased.

## 5. Training Programme for food and quality control in Thailand

The key technical persc nels currently employed at the project were needed more training in the processing and quality control areas. The training was proposed to be done in the pioneer canned tuna factory in Thailand for the first hand knowledge on the job training as well as training at the Institute of Food Research and Product Development. The training programme cover of the following areas :

- Principle of food preservation
- Thermal processing of food canning
- Metal container and double seam evaluation
- Quality Control of canned seafood Microbiological assay
- Micro biological examination of raw material
- Micro biological examination of canned seafood products
- Quality control of seafood products
- Tilth and Extraneous materials methods of Analysis and Laboratory practice.
- On the job training for fish handling, cooking, cleaning, packing and sterization.

## 6. Conclusions and Recommendations

The processing of fish in this pilot plant prior to seaming was carried out entirely by manual means. Although the plant has premise and facilities almost completed, additional equipments as proposed should be purchased in order to complete the project.

The potential for seafood canning industry in Vietnam is immense. With the proper managing of the resources the seafood canning industry will be one of the country top employer of labours and foreign exchange earning.

------------------

# ANNEX I

## ORGANOLEPTIC INSPECTION

Products of Vietnam (307x113 2 pcs can, gold TP end)
TFS

1. Skipjack Solid in Oil - Acceptable

| Code | Color of can | Ctns (48) | Result of Check/Remark |
|---|---|---|---|
| 1994 SEP0591 M1401S | Gold | 1 | - Fair quality → low market; over N/W and no vac. |
| 1994 SEP0691 M1401S | Gold | 4 | - Medium quality Slight salty (~ 1.3-1.5 %) Over N/W and no vac. |
| 1994 SEP0791 M1401S | Gold | 10 | - Medium quality Salty (1.5-1.8 %) Over N/W and no vac. |
| 1994 SEP91 M1401S | Gold | Unknown quantity | - Fair quality (border line accept) → low market varied salt content (< 1.0% to 1.8%) |

- Rejectable

| Code | Color of can | Ctns (48) | Result of Check/Remark |
|---|---|---|---|
| 1994 SEP279. M1401S | Gold | 1 | Decomposition, over N/W, no vac. |
| 1994 OCT1991 M1401S | Gold | 4 | Decomposition, over N/W, no vac. |
| 1994 NOV91 M1401S | Gold | 55 | Decomposition, over N/W, no vac. |
| | Total | 60 | |

2. Skipjack Chunk in Oil - Acceptable

| Code | Color of Can | Ctns (48) | Result of Check/Remark |
|---|---|---|---|
| M18G91<br>1401C | Gold | 9 | - Fair quality → low market<br>Over N/W and no vac. |
| M20G91<br>1401C | Grey | 28 | - Medium quality<br>Varied salt content ( < 1% to 1.8%)<br>Over N/W and no vac. |
| M24G91<br>1401C | Gold | 4 | - Fair quality → low market<br>Over N/W and no vac. |
| M25G91<br>1401C | Gold | 15 | - Fair quality → low market<br>(Tonggol mixed with Skipjack in same ca<br>Over N/W and no vac. |
| M26G91<br>1401C | Gold | 55 | - Fair quality → low market<br>Rather salty (~ 1-1.75%)<br>Over N/W and no vac |
| M27G91<br>1401C | Gold | 46 | - Medium quality<br>Varied salt content (~ 1.3-1.95%)<br>Over N/W and no vac. |
| M06H91<br>1401C | Gold | 40 | - Medium quality<br>Over N/W and no vac. |
| M09H91<br>1401C | Grey | 1 | - Fair quality → low market<br>Over N/W and no vac. |
| M10H91<br>1401C | Grey | 1 | - Fair quality → low market<br>Over N/W and no vac. |
| | Total | 199 | |

2. Skipjack Chunk in Oil - Rejectable

| Code | Color of Can | Ctns (48) | Result of Check/Reamrk |
|---|---|---|---|
| M22C91 1401C | Gold | 2 | - Poor cleaning, decomposition Over N/W and no vac. |
| M05H91 1401C | Grey | 6 | - Poor texture |
| | Total | 8 | |

3. Skipjack Flake in Oil - Acceptable

| Code | Color of Can | Ctns (48) | Result of Check/Remark |
|---|---|---|---|
| 1994 DEC0291 M1401F | Gold | 45 | - Fair quality ——→ low market (rancid, overcook, scorch) Short N/W some can |

- Rejectable

| Code | Color of Can | Ctns (48) | Result of Check/Remark |
|---|---|---|---|
| 1994 SEP91 M1401F | Gold | Unknown quantity | - Decomposition Over N/W and no vac. |

4. Bonito Solid in Oil - Acceptable

| Code | Color of Can | Ctns (48) | Result of Check/Remark |
|---|---|---|---|
| 1994 SEP0691 M0101S | Gold | 4 | - Fair quality → low market Overweight and no vac. |
| 1994 SEP0891 M0101S | Gold | 5 | - Fair quality → low market Overweight and no vac. |
| 1994 SEP1291 M0101S | Gold | 5 | - Fair quality → low market Overweight and no vac. |
| 1994 SEP1591 M0101S | Gold | 8 | - Fair quality → low market Overweight and no vac. |
| 1994 SEP1691 M0101S | Gold | 4 | - Fair quality → low market Overweight and no vac. |
| 1994 SEP1791 M0101S | Gold | 9 | - Fair quality → low market Overweight and no vac. |
| 1994 SEP1891 M0101S | Gold | 8 | - Fair quality → low market Overweight and no vac. |
| M05J91 0101S | Gold | 4 | - Fair quality → low market Overweight and no vac. |
| M12091 0101S | Grey | 27 | - Medium quality Over N/W and no vac. |
| 1994 | Gold | Unknown quantity | - Fair quality → low market Over N/W and low vac (0-1 in Hg) |
| | Total (excluding unknown) | 74 | |

4. <u>Bonito Solid in Oil</u> - Rejectable

| Code | Color of Can | Ctns (48) | Result of Check/Remark |
|---|---|---|---|
| 1994 SEP0591 M0101S | Gold | 3 | - Decemposition Over N/W and no vac. |
| 1994 SEP0791 M0101S | Gold | 8 | - Discoloration Over N/W and no vac. |
| 1994 SEP0991 M0101S | Gold | 1 | - Decomposition Over N/W and no vac. |
| 1994 SEP1491 M0101S | Gold | 2 | - Decomposition Over N/W and no vac |
| M04J91 0101S | Gold | 7 | - Discoloration Over N/W and no vac. |
| 1994 NOV91 M0101S | Gold | 131 | - Decomposition Over N/W and no vac. |
| | Total | 153 | |

5. Bonito Chunk in Oil - Acceptable

| Code | Color of can | Ctns (48) | Result of Check/Remark |
|---|---|---|---|
| M23G91<br>0101C | Grey | 28 | - Fair quality ⟶ low market<br>Histamine ~ 50 ppm.<br>Over N/W and no vac. |
| M24G91<br>0101C | Grey | 26 | - Fair quality ⟶ low market<br>Rather salty (1.3-20%)<br>Over N/W some can (vac 0-1 in Hg) |
| M29G91<br>0101C | Grey | 43 | - Fair quality ⟶ low market<br>Over N/W and low vac. |
| M25G91<br>0101C | Grey | 14 | - Medium quality |
| M30G91<br>0101C | Grey | 44 | Slsalty some can (~ 1.3-1.5%)<br>Over N/W and no vac |
| M31G91<br>0101C | Grey | 41 | - Fair quality ⟶ low market<br>Over N/W and no vac. |
| M01H91<br>0101C | Grey | 72 | - Fair quality ⟶ low market<br>Slight salty (~ 1.3-1.5%)<br>Over N/W and low vac. |
| M02H91<br>0101C | Grey | 70 | - Medium quality<br>Rether salty (~ 1.5-2.0%)<br>Over N/W and low vac. |
| M03H91<br>0101C | Grey | 57 | - Medium quality<br>Rether salty (~ 1.5-2.0%)<br>Over N/W and low vac. |
| M07H91<br>0101C | Grey | 47 | - Medium quality<br>Over N/W and no vac. |
| M[illegible]H91<br>[illegible]01C | Grey | 62 | - Fair quality ⟶ low market<br>Over N/W and no vac. |
| M09H91 | Grey | 57 | - Fair quality ⟶ low market<br>Over N/W and no vac. |

Bonito Chunk in Oil - Acceptable (continued)

| Code | Color of can | Ctns (48) | Result of Check/Remark |
|---|---|---|---|
| M10H91 0101C | Grey | 61 | - Fair quality → low market<br>Over N/W and no vac. |
| M05J91 0101C | Gold | 19 | - Medium quality<br>Rather salty (~ 1.3-1.7%)<br>Over N/W and no vac. |
| 1994 SEP0591 M0101C | Gold | 40 | - Fair quality → low market<br>Over N/W and no vac. |
| 1994 SEP0691 M0101C | Gold | 49 | - Fair quality → low market<br>Histamine ∠ 100 ppm.<br>Over N/W and no vac. |
| 1994 SEP1291 M0101C | Gold | 49 | - Medium quality<br>Varied salt (~ 1.3-1.8%)<br>Over N/W and no vac. |
| 1994 SEP1791 M0101C | Gold | 52 | - Medium quality<br>Slight salty (~ 1.3%)<br>Over N/W and no vac. |
| M13G91 0101C | Grey | 16 | - Medium quality<br>Slight salty (1.3-1.5%)<br>Poor color<br>Over N/W and no vac. |
| | Total | 897 | |

Bonito Chunk in Oil - Rejectable

| Code | Color of Can | Ctns (48) | Result of Check/Remark |
|---|---|---|---|
| 1994 SEP0791 M0101C | Gold | 52 | - Honeycomb<br>Over N/W and no vac. |
| 1994 SEP1491 M0101C | Gold | 7 | - Decomposition<br>Over N/W and no mac. |
| 1994 SEP1591 M0101C | Gold | 43 | - Honeycomb<br>Over N/W and no vac. |
| 1994 SEP1691 M0101C | Gold | 20 | - Decomposition<br>Over N/W and no vac. |
| 1994 SEP1891 M0101C | Gold | 52 | - Decomposition<br>Over N/W and no vac. |
| 1994 DEC91 M0101C | Gold | Unknown | - High histamine content, not fresh fish - (176 ppm) |
| M22G91 0101C | Grey | 31 | - Decomposition<br>Over N/W and no vac. |
| M21G91 0101C | Grey | 14 | - Discoloration<br>Over N/W and no vac. |
| M27G91 0101C | Grey | 7 | - Honeycomb<br>Over N/W and no vac. |
| M04J91 | Gold | 48 | - Decomposition<br>Over N/W and no vac. |
| | TOTAL (excluding unknown) | 274 | |

6. Bonito Flake in Oil - Acceptable

| Code | Color of can | Ctns (48) | Result of Check/Remark |
|---|---|---|---|
| 1994<br>SEP0519<br>M0101F | Gold | 9 | - Fair quality ⟶ Low market<br>Some cans are salty (~ 1.5-1.8%)<br>Low vac ([illegible] in Hg) |
| 1994<br>SEP0691<br>M0101F | Gold | 14 | - Fair quality ⟶ Low market<br>Histamine < 100 ppm.<br>Over N/W and no vac. |
| 1994<br>SEP0791<br>M0101F | Gold | 14 | - Fair quality ⟶ Low market<br>Histamine 59 ppm.<br>Slight salty (~ 1.3%)<br>Over N/W and no vac. |
| 1994<br>SEP0891<br>M01[illegible] | Gold | 10 | - Medium quality<br>Rather salty (1.8%)<br>Over N/W and no vac. |
| | Total | 47 | |

Bonito Flake in Oil - Rejectable

| Code | Color of can | Ctns (48) | Result of Check/Remark |
|---|---|---|---|
| 1994 SEP1791 MC101F | Gold | 11 | - Decomposition Over N/W and no vac. |
| 1994 SEP1891 M0101F | Gold | 15 | - Decomposition Over N/W and low vac (0-2 in Hg) |
| 1994 NOV91 M0101F | Gold | 101 | - Decomposition (no vac some can) |
| | Total | 127 | |

| Conclusion : | | | Accept (ctn/48) | Reject (ctn/48) |
|---|---|---|---|---|
| | Skipjack in oil | Solid | 15 + Unknown | 60 |
| | | Chunk | 199 | 8 |
| | | Flake | 45 | Unknown |
| | Bonito in oil | Solid | 74 + Unknown | 153 |
| | | Chunk | 897 | 274 Unknown |
| | | Flake | 47 | 127 |

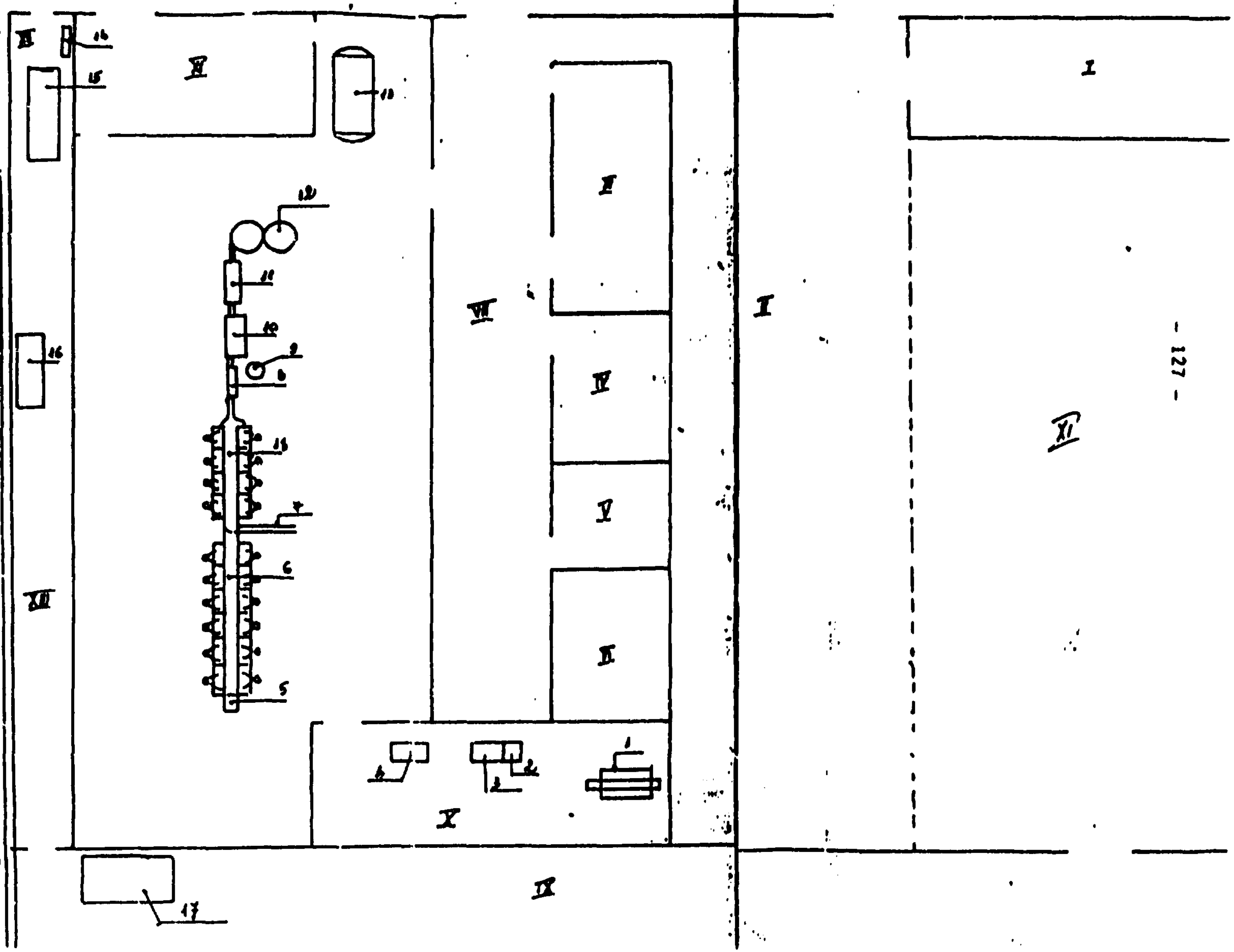
# MẶT BẰNG NHÀ MÁY ĐỒ HỘP

(plan of canning factory)   Tỷ lệ: 1/200

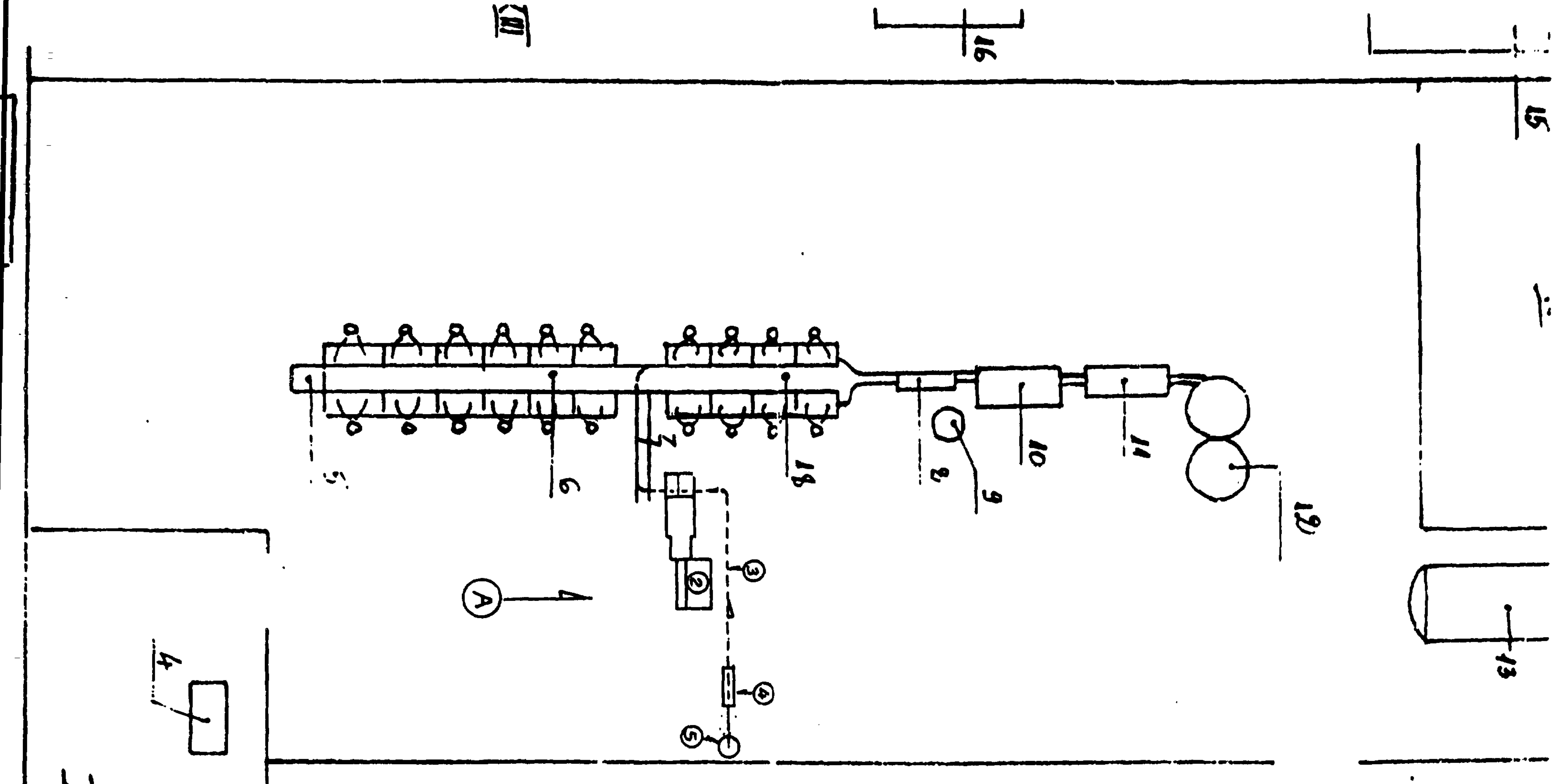
ANNEX II

SEAPRODEX Plant No 2

Existing Plant Lay Out




| | |
|---|---|
| Số TT | Equipment and processing area (trang thiết bị trong máy và khu vực) |
| I | Finish product storage (kho thành phẩm) |
| II | Material storage (kho vật tư) |
| III | Office (văn phòng) |
| IV | Dining room (phòng ăn) |
| V | Gentlemen W.C (phòng vệ sinh nam) |
| VI | Lady W.C (phòng vệ sinh nữ) |
| VII | Lobby (hành lang) |
| VIII | Processing area (khu vực chế biến) |
| IX | Material handling area (khu vực xử lý nguyên liệu) |
| X | Sauce blending room (phòng pha chế nước sốt) |
| XI | Area for future development (nơi dự trữ) |
| 1 | Gutting table (bàn mổ ruột cá) |
| 2 | Cooking vessel (nồi luộc nguyên) |
| 3 | Cooling vessel (nồi làm nguội) |
| 4 | Steam vessel (nồi hấp) |
| 5 | Conveyor line (băng chuyền thành phẩm) |
| 6 | Filling line (băng chuyền xếp cá) |
| 7 | Conveyor line (băng chuyền vô hộp) |
| 8 | Filling machine for brine (máy bơm nước muối) |
| 9 | Sauce vessel (nồi nấu sốt) |
| 10 | Seaming machine (máy ghép hộp) |
| 11 | Washing machine (máy rửa hộp) |
| 12 | Round table (bàn tròn) |
| 13 | Autoclave (nồi thanh trùng) |
| 14 | Air compressor (máy nén khí) |
| 15 | Boiler (nồi hơi) |
| 16 | Air conditioner (máy điều hòa không khí) |
| 17 | Freezing storage (kho trữ quản lạnh) |
| 18 | Packing table (bàn xếp hộp) |

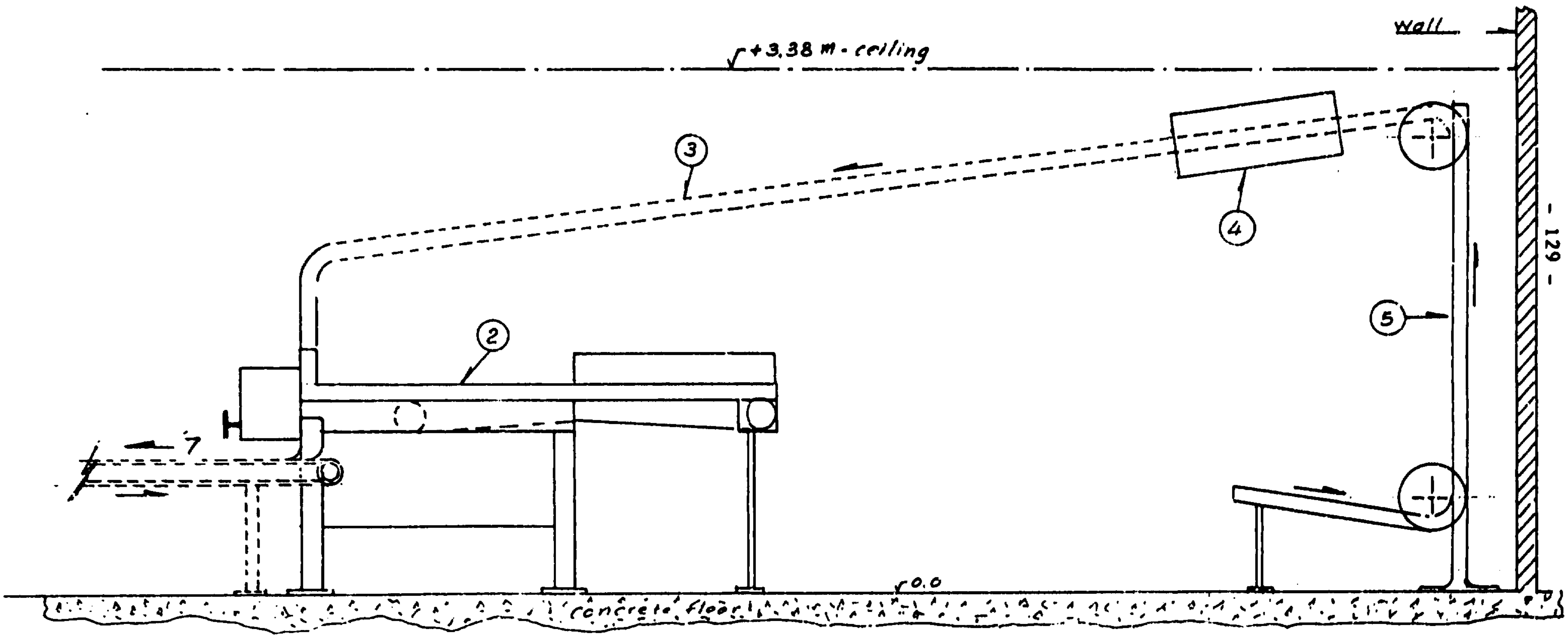



| Item | Description |
|---|---|
| 7 | Existing can transfer line |
| ② | Tuna filler "PAK-SHAPER |
| ③ | Empty-can Race way |
| ④ | Empty-can Cleaner |
| ⑤ | Empty-can-feed Elevator |

Proposed Machine Lay Out for..
SEAPRODEX Plant No.2 to Produce
High Quality Canned Tuna
Designed by Parichet P.
Date 30 March 1992, Scale 1:100

| Item | Description |
| --- | --- |
| 7 | Existing can transfer line |
| ② | Tuna filler "PAK-SHAPER |
| ③ | Empty-can Race way |
| ④ | Empty-can Cleaner |
| ⑤ | Empty-can-feed Elevator |

DWG. Detail Ⓐ
Scale 1:25



ANNEX III

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

March 1992

Project in the Socialist Republic of Viet Nam

Job Description
DP/VIE/87/002/11-52/J 13103
DP/VIE/87/002/11-54/J 13103

**Post title:** Fish processing expert (trainer)

**Duration:** 0.2 m/m each

**Date required:** 23 to 28 March 1992 (1st split mission)
29 June to 4 July 1992 (2nd split mission)

**Duty station:** Ho Chi Minh City with travels within the country

**Purpose of project:** To increase the quality, quantity and variety of marine products processed by SEAPRODEX Plant No. 2 and to disseminate fish/food processing technologies and quality control procedures gained through this project to other processing plants in Viet Nam.

**Duties:** The fish processing expert, working in close cooperation with the National Project Director and the project fellows which are going to be trained in Thailand will specifically be expected to carry out the following duties:

- Prepare a training programme for the project counterpart in the field of fish processing technology, maintenance and repair of technological equipment;

- Assist the application of the knowledge gained during the fellowship training in Thailand to the project's fish processing operations;

- Evaluate the implemented fellowship programme in the field;

The expert will also be expected to prepare, together with the fish quality control expert, a short report, setting out the finding of his missions and his recommendations to the training programme foreseen.

**Qualifications:** Highly experienced fish industry expert specialized in modern fish processing technologies and having experience in training.

**Language:** English, Vietnamese

**Background information:**

At present, there are about 63 fish processing plants in Viet Nam. They are able to freeze 353 mt/day and can hold 8,200 mt in their cold stores. Three of them are canning plants but none is operating efficiently mainly due to the lack of skilled personnel. Other plants are producing dried or frozen fish, such as squids, shrimps, scallops, mackerel, pompfret, red snapper, grouper, catfish, shark fin and some minor types.

The fishery sector plays an important role in Viet Nam's economy. It is one of the major sources of foreign currency earnings and a major employer. Although in 1987 the industrial production of fish reached 1 million tons, total exports were 92,897 mt only (constituting 9.2% of the total catch).

There are difficulties to produce high quality processed fish in Viet Nam. One major reason is the insufficient supply of ice for fish storing, neither for the boats nor for the landing sites. Another main problem is the poor hygienic standard of buildings, drains, water basins, processing equipment, process water and personnel.

The Government's plan to support the fishery industry recognizes the above-mentioned facts and aims at getting foreign expertise, equipment and establishing joint ventures to upgrade the industry. Special emphasis is given to the training of the local labour force in the new process technologies, packaging methods, laboratory techniques and quality control schemes.

**UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION**

March 1992

Project in the Socialist Republic of Viet Nam

**Job Description**

DP/VIE/87/002/11-53/J 13103
DP/VIE/87/002/11-55/J 13103

**Post title:** Fish quality control expert (trainer)

**Duration:** 0.2 m/m each

**Date required:** 23 to 28 March 1992 (1st split mission)
29 June to 4 July 1992 (2nd split mission)

**Duty station:** Ho Chi Minh City with travels within the country

**Purpose of project:** To increase the quality, quantity and variety of marine products processed by SEAPRODEX Plant No. 2 and to disseminate fish/food processing technologies and quality control procedures gained through this project to other processing plants in Viet Nam.

**Duties:** The fish quality control expert, working in close cooperation with the National Project Director and the project fellows which are going to be trained in Thailand will specifically be expected to carry out the following duties:

- Prepare a training programme for the project counterpart in the field of fish quality control, maintenance and repair of quality control laboratory equipment;

- Assist the application of the knowledge gained during the fellowship training in Thailand to the project's quality control operations;

- Evaluate the implemented fellowship programme in the field;

The expert will also be expected to prepare, together with the fish processing expert, a short report, setting out the finding of his missions and his recommendations to the training programme foreseen.

**Qualifications:** Highly experienced fish quality control expert specialized in modern fish quality control technologies and having experience in training.

**Language:** English, Vietnamese

**Background information:**

At present, there are about 63 fish processing plants in Viet Nam. They are able to freeze 353 mt/day and can hold 8,200 mt in their cold stores. Three of them are canning plants but none is operating efficiently mainly due to the lack of skilled personnel. Other plants are producing dried or frozen fish, such as squids, shrimps, scallops, mackerel, pompfret, red snapper, grouper, catfish, shark fin and some minor types.

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The Government's plan to support the fishery industry recognizes the above-mentioned facts and aims at getting foreign expertise, equipment and establishing joint ventures to upgrade the industry. Special emphasis is given to the training of the local labour force in the new process technologies, packaging methods, laboratory techniques and quality control schemes.

**B. 2nd split mission - 6 days - 29 June to 4 July 1992**

Somkiat Tavornpanich, Fish processing expert (trainer) - post DP/VIE/87/002/11-54
Damrong Sirakovit, Fish quality control expert (trainer) - post DP/VIE/87/002/11-55

(same job description as for 1st split mission)

## 1. The Objectives

The subscribers, in cooperation with the National Project Director had carried out the following duties :

- Prepare a training programme for the project counterpart in the field of fish processing technology, fish quality control, maintenance and repair of technological equipment;
- Assist the application of the knowledge gained during the fellowship training in Thailand to the project's fish processing and quality control operations ;
- Evaluate the implemented fellowship programme in the field.

## 2. INTRODUCTION

### The Fish Canning Project

The United Nations Development Programme and the United Nation Industrial Development Organization assisted in establishing a pilot plant at the Vietnam National Sea Products Export Corporation - Special Sea Products Import and Export Company (commonly known as SEASPIMEX or SEAPRODEX factory No. 2) located at 213 Hoa Binh Street, Tan Binh District, Ho Chi Minh City, Vietnam. This pilot plant was to serve both as a learning ground and an experimental centre to initiate a core of managers and engineers into technology and business concerned so that they could be given the responsibility of planning and implementing future investment of full scale industrial plants.

The inception of this project occurred during 1991. Most of the supervisory and key technical personnel needed by this project have been employed.

The test run was conducted during 1991 which some products were produced during that period. The total 1899 samples were drawn for evaluation. Of those samples, 1277 were acceptable quality and 622 samples were rejected. This represented 37.75% inferior quality to the international standard.

The finding highlighted the need to improve the personnel knowledge in processing and quality control technology as well as completing the plant equipment.

## 3. The Fellowship Training in Thailand

### A. The Trainees

The ten staff members from SEASPIMEX. Vietnam attend a six week training programme in Thailand are :

Group 1 - period Feb. 24 - Apr. 4

1. Ms. Le Thi Khanh Van - Chief Laboratory
2. Mrs. Tran Thi Kim Xuan - Assistant Director
3. Mr. Nguyen Trang Lap - Quality Control Supervisor
4. Mr. Vo Phouc Hoa - Assistant Director
5. Mrs. Le Xuan Dung - Production Supervisor

Group 2 - period Mar. 9 - Apr. 16

1. Mr. Dao Tri Tong - Laboratory Microbiologist
2. Ms. Lun Thi Phuong Duy - Laboratory Chemist
3. Mr. Tronong Quoc Thanh - Engineer
4. Mr. Nguyen Duong Hieu - Engineer
5. Mrs. To Thi Trinh Thuc - Production Supervisor

### B. The Training Courses on Food Technology

The courses were conducted in cooperation between Kingfisher Holdings Group of Companies, Southeast Asian Laboratories Ltd. and Institute of Food Research and Product Development in the following fields :

- Principle of Food Preservation
- Food Container
- Food Spoilage
- Food Analysis and Testing
- Thermal Process and Fo Value determination
- Quality Control

- Chemical Analysis
- Physical Analysis
- Microbiological Analysis
- On the job training for
    * Raw Material Inspection
    * Processing Management and Technique
    * Plant Processing Machine Adjustment. Repair and Maintenance
    * Post Processing Control

The training programmes have been completed and achieved its goal.

4. <u>The Installation of Additional Equipment</u>

The additional equipment have been purchased by UNDP/UNIDO under the project DP/VIE/87/002 were :

A. Steam Flow Set to be fitted to the Somme Seaming Machine to create vacuum in can products.

B. Automatic Tuna Cutting and Filling Machine (Pak Shaper)

C. Empty Can Washer together with the complete line for can elevator and can race way.

D. Automatic Can Labeller

All the equipments shipped to Ho Chi Minh City have been cleared out from the Customs and arrived in good condition in the SEASPIMEX's plant on and before 26 June 1992.

The subscribers together with the installation technicians arrived in Ho Chi Minh City on 29 June 1992. The installation commenced immediately after the arrival. The installation of Automatic Tuna Cutting and Filling Machine (Pak Shaper). Automatic Can Labeller and Empty Can Washer line have been completed smoothly as all parts have been prefabricated from the supplier. Only the Steam Flow Set installation had posted small problem as the parts made was not quite fitted to the machine. But with the expertise of the technician. some modification has been done to complete the installation on 2 July 1992.

## 5. Test Running

The test running of the new complete processing line has been carried out for 3 consecutive days from 2-4 July 1992. Due to the available knowledge of SEASPIMEX's staff. The subscribers on this mission have concentrated their training activities on the application of the additional equipments and improvements to be arrived from such investments.

The plant prime objective was to serve as a pilot plant for training in canned seafood processing development. The plant is now could be operated as one of a complete unit as all the installed equipments are very modern and suitable for the purposes.

In addition to the prime objective the plant could be produced commercial products for the market. In analysing the existing equipments output some bottlenecks should be corrected in order to increase the plant competitiveness in the commercial aspect.

- Precooking. The existing two units precookers could produce only maximum 100 kgs per hour of raw material.

- The Cabin Plant conveyor system could handle upto one metric ton of raw material per hour.

- The Pak Shaper tuna cutting and filling machine could handle 100 cans per minute or 6000 cans per hour at 100 percent efficiency. This is equivalent to two metric tons of raw materials per hour.

- The closing machine has speed of 50 cans per minutes or one metric ton per hour.

- The Retort one unit could handle 3000 cans for one cycle which require 2 hours processing or equal to 500 kgs of raw material per hour.

- The labelling machine has capacity to run at 200 cans per minute which means has excess capacity to cope with the operation.

6 . <u>Conclusions</u>

The subscribers have recommended to the management that the plant has reached the prime objective in completing the equipment for training purposes. The products could meet the world market standard. The management plans to market the product into the world market could be now in a better position because of higher qualified staff who have undergone training in Thailand and the additional equipments could produce standard products.

## V. COMMENTS BY THE PROJECT BACKSTOPPING OFFICER

This report has been compiled by the backstopping office based on the technical reports of the project's CTA and fish processing expert, Mr. O. Kirkegaard and the quality control experts, Messrs. I. Mizuishi and B. Andreasen.

A fish canning line and a food quality control laboratory have been established and are now fully operational. The facilities are modern and the best of this kind in the country. The plant should be considered as focal point and used for experimental and demonstration purposes for technology transfer and training of the national fish processing industry's workforce. A number of counterpart experts have been trained abroad in fish processing (canning) technology and quality control techniques.

Due to limited financial resources not all originally planned processing equipment has been purchased; the most needed equipment to complete the canning line is itemized in Annex I. Attached as Annex II is the list of still needed laboratory equipment and chemicals. Moreover, a study tour to Europe for two persons is required, where they are to be made acquainted with the European market requirements for canned fish products. In addition, fellowship training for one person in physical and chemical testing/quality control of seafood and for one person in microbiology is needed (details are given in Annex 3).

ANNEX I

**LIST OF TECHNOLOGICAL EQUIPMENT REQUIRED**
**FOR COMPLETION OF THE CANNING LINE**
**PROJECT DP/VIE/87/002**

---

1. Water purification plant
2. Waste water treatment plant, cleaning and desinfecting equipment
3. Automatic balance
4. Oval figure seaming machine
5. Vacuum packaging equipment for dry fish products.

Estimate of required funds: US$ 150,000 - 200,000.

ANNEX II

**LIST OF LABORATORY EQUIPMENT AND CHEMICALS**
**STILL NEEDED TO BE PURCHASED**
**PROJECT DP/VIE/87/002**

---

1. Physical and chemical laboratory:

1.1. Equipment and instruments:

1. Muffle furnace ( approx. 1000° C)
2. Ultrasonic washer for HPLC
3. Precolumn, for HPLC fitting with spectrophotometer (used to prevent damage of main column)
4. TVN-apparatus (distillation method - "Struers").
5. Standard thermometer to check the accuracy of other thermometers
6. Standard hydrometer
7. Spectrophotometer (common type) to determine substances
8. Vacuum pump ior quick filter
9. Protein content testing equipment.

1.2. Chemicals

For phosphate, poliphosphate analysis:

1. Sodium molybdate ($Na_2$ $MoO_4$, 2 $H_2O$)
2. Ammonium nitrate ($NH_4$ $NO_3$)
3. Sodium pyrosulfite ($Na_2$ $S_2O_5$)
4. Sodium sulfite ($Na_2$ $SO_3$)
5. Monomethyl - p - amino phenol sulfate
6. Isopropanol (2-propanol)
7. Sodium phrophosphate ($Na_4P_2O_7$, 10 $H_2O$)
8. Trisodium phosphate ($Na_3PO_4$, 12 $H_2O$)
9. Sodium tripoliphosphate ($Na_5P_3O_{10}$)

Especially made only for HPLC:

10. Histidine
11. Acetone
12. Acetonitol
13. Methanol
14. Benzen ($C_6H_6$)
15. Hexan
16. Solution or powder to wash electrode
17. Standard buffer (for pH-meter)
    - Potassium hydrogen phthalate (pH 4.01 - powder)
    - Borax (pH 9.18 - powder)
    - Tris hydroximethyl aminomethane
18. Aluminium oxide
19. Quinine
20. Tetrachloroethylene
21. N-pentane
22. Methyl/ethyl propyl ester of hydroxibenzoic acid
23. Sodium sulfate anhydrous

3. Miscellaneous
1. Paper Chromatograph (Munktell S 312 or Whatman no.1 and Schleicher Schull or Whatman no. P81)
2. Thin layer plates (Merck TLC)
3. Micropipette (0.010 ml x 0.025 ml)
4. Microsyringe (square end point): 20 ml
5. Round filter - diameter 5.5 cm (Schleicher and Schull, Schartzband 589-1, Whatman no. 41 or Munktell 00M.

2. Microbiology laboratory

2.1. Equipment

1. Sterilize filter (0.2 mm) - (3 pcs)
2. Listeria-Tek 96 test kit - (5 tests) (Elisa test system organon)
3. Microelisa washer (2) (Organon teknika no. 00160)
4. Microelisa reader (2) (Organon teknika no. 36200)
5. Multichannel pipette (50 - 200 ml) (2) (Organon teknika no. 36207)
6. Singlechannel pipette (50 - 200 ml) (5) (Organon teknika no. 36205)
7. Disposable micropipette tips (200 pcs) (Organon teknika no. 38055)
8. Data record sheets (50 tests) (Organon teknika no. 52101)
9. Reservoir troughs (rinsable)
10. Flat tube with plague for coliforms test (50 pcs)
11. Dispenser (10 ml) (2 pcs)

2.2. Culture media

1. Peptone (4 kg)
2. Baird-Parker's (1 kg)(including base + enrichment)
3. Slanetz agar (1 kg)
4. Iron agar (1.5 kg)
5. Violot red bile. agar (1.5 kg)
6. Disodium hydrogen phosphate ($Na_2HPO_4$ 12 $H_2O$) (3 kg)
7. Potassium dihydrogen phosphate ($KH_2PO_4$) (0.5 kg)
8. Rappaport Vassiliadis (RV) broth (0.5 kg)
9. Brilliant green phenol red agar (Edel and Kampelmacher) base (0.7 kg)
10. Lactose (0.5 kg)
11. Sucrose (0.5 kg)
12. Phenol red (0.005 kg)
13. Brilliant green (0.002 kg)
14. Xylose-lysine-desoxycholate agar (1 kg)
15. Lysine iron agar (0.2 kg)
16. Triple sugar iron agar (0.5 kg)
17. Urease test broth (0.5 kg)
18. Listeria enrichment broth I (0.5 kg)
19. Listeria enrichment broth II (0.5 kg)
20. Enrichment broth EB (0.5 kg)
21. Oxford agar (1 kg)
22. Tryptase blood agar base (0.5 kg)
23. Brain heart infusion broth (0.5 kg)

24. Bacto tryptose (0.5 kg)
25. Meat extract (0.5 kg)
26. Rhamnose (0.5 kg)
27. Xylose (0.5 kg)
28. ID Test Enterobacteriaceae 20 (100 tests (dehydrated form)
29. LPM agar (1 kg)
30. Sodium moxalactam (Sigma M1900) (0.050 kg)

The quantity of the dehydrated culture media vary a little according to the package.

ANNEX III

## FELLOWSHIP TRAINING
## PROJECT DP/VIE/87/002

Study scope: Chemical determination of sea products and foodstuffs (for one person)

Required tests

1. Histamine determination by HPLC with F-1050 Fluorescence detector using dansylchloride as fluorescent labelling of amino acids.
2. Determination of other amino acids
3. Indol Test
4. Heavy metal determination (especially Hg)
5. Additives & preservatives (the most common substances allowed in foodstuffs at present)
- Qualitative and quantitative tests
- Phosphate and poliphosphate
- Sorbitol and glycerol
- Citric acid - sorbic acid - benzoic acid - salicitric acid
- EDTA
6. Colourings in food (natural and synthetic organic colourings)
- Qualitative and quantitative tests
- Stabilizers
7. Determination of toxine in foodstuffs and canned seafood

Study scope: Microbiology (for one person)

Required tests

1. Lactic acid bacteria
2. Detecting listeria monocytagenes by normal test
3. Detecting listeria monocytogenes by Elisa method
4. Detecting salmonella by Elisa method
5. Campylobacter jejuni/coli