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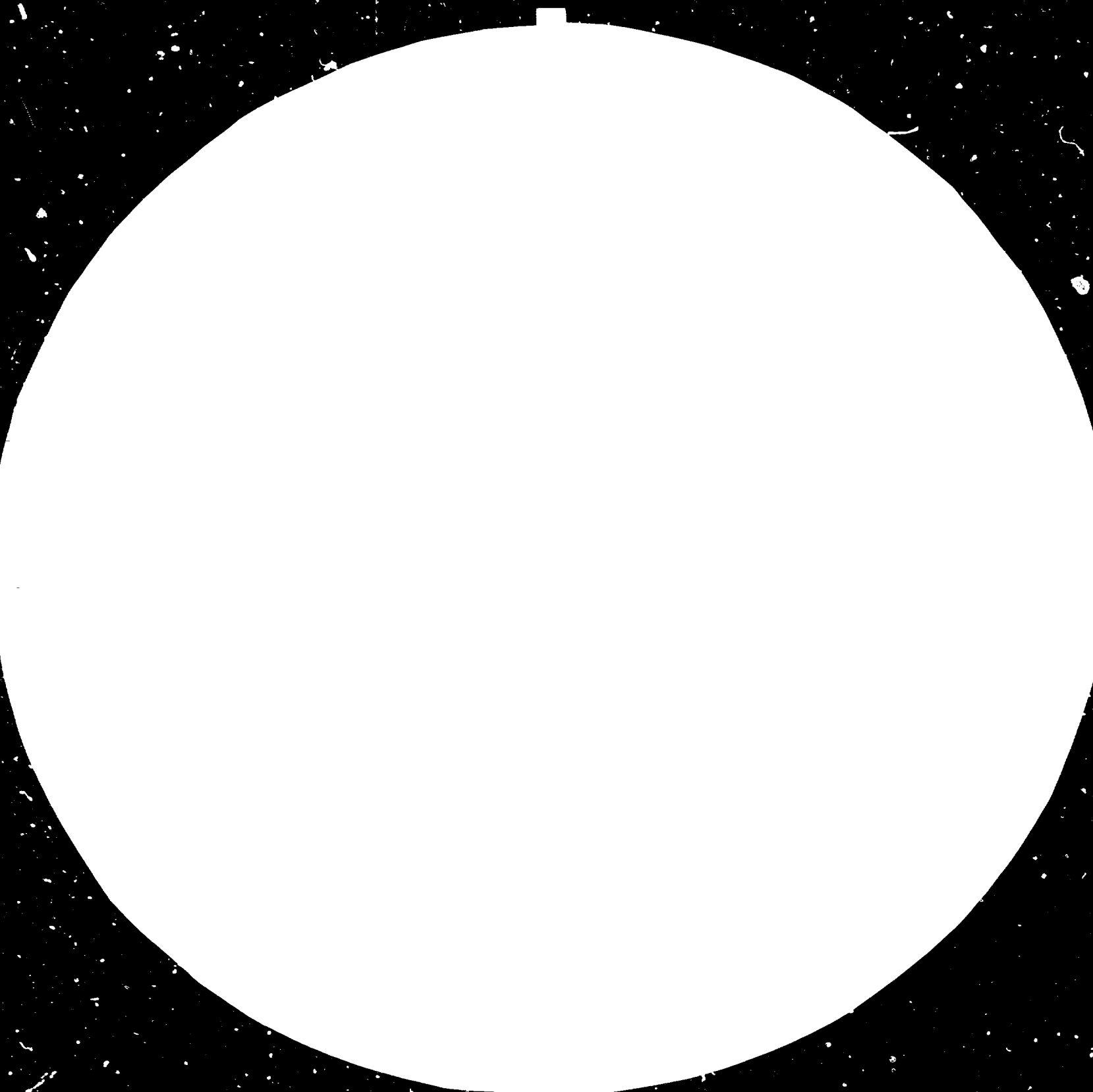

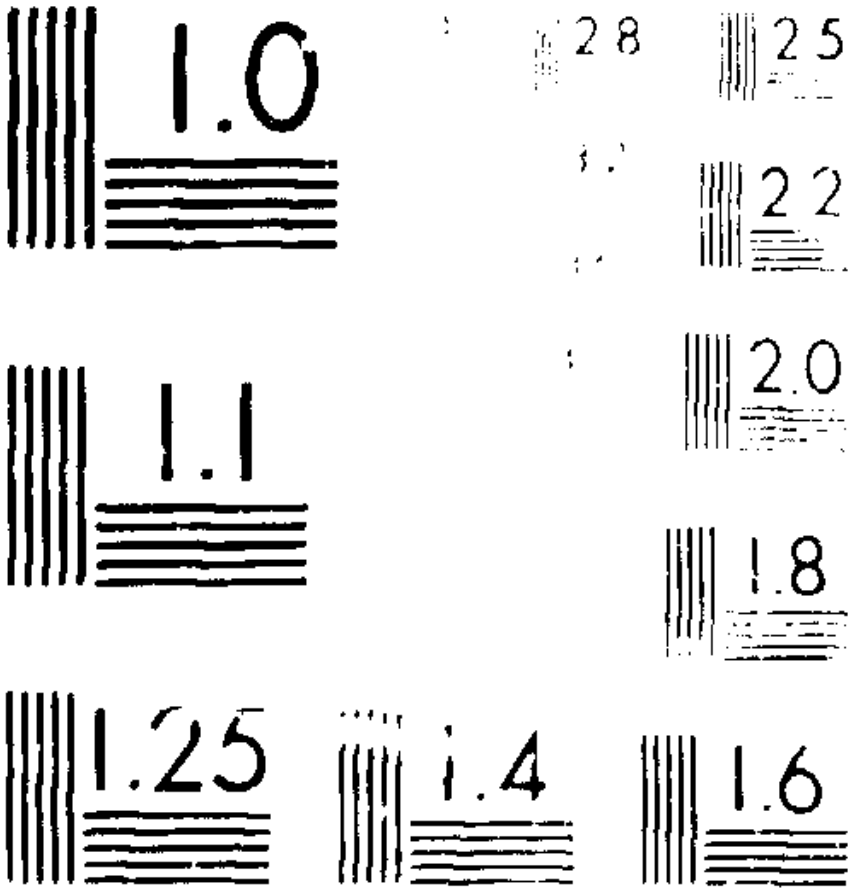
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DP/ID/SER.A/456
8 July 1983
English

PRODUCTION OF BAKERS' YEAST IN HANOI

DP/VIE/80/040
VIET NAM

Technical report*: Assessment of the Existing Bakers' Yeast Facilities

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 Georg Anderle
Bakers' Yeast Technologist (Chief Technical Adviser)

United Nations Industrial Development Organization
Vienna

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I. INTRODUCTION

The main purpose of the project was to assist in modernizing and increasing the production of the bakers' yeast required by bakeries in Hanoi and neighbouring provinces.

The main duties of the Bakers' Yeast Technologist (Chief Technical Adviser) were to make an assessment of the existing bakers' yeast facilities in respect to the building condition, existing equipment, electricity, water and steam supply, as well as the technical personnel. Also, the expert was expected to prepare a flow sheet and layouts for the technological process and equipment. The field assignment took place from the middle of March until the end of April 1983 with an additional two weeks for the completion of documentation and the inspection of second hand equipment which may be considered for purchase from the project funds. The Job Description is attached as Annex I.

II. GENERAL OBSERVATIONS

The existing plant (with a production of 15 tonnes bakers' yeast/year) has not been operating for more than two months due to a mechanical breakdown of the separators. There do not exist any records about yeast production for 1983.

The last reports available mention that the last yeast production was from 28 November to 10 December 1982, producing 647.2 kg yeast (with 75% water) from 5.440 kg molasses. The process applied for the yeast production is more a handicraft than an industry.

As the production unit is not in operation, the assessment of the existing equipment and its suitability for further use was extremely difficult. For the same reason it was not possible to measure the consumption and availability of steam, water and electricity supply, but only to estimate it.

The reconstruction of the yeast plant is already some years in discussion, and there is already a project elaborated by the technical staff of the Hanoi Food Supply and Tuong Mai, whose aim is to increase production up to 150 tonnes yeast/year with locally supplied equipment

It is foreseen to:

- transfer the yeast production into another already existing building;
- install a 1.5 tonnes/hour steam boiler;
- install a 18 m^3 main fermenter, as well as a new propagation and pre-fermentation unit;
- install an adequate molasses treatment; and
- adopt a new yeast cream storage and yeast packing system.

The main part of the engineering work is already concluded. Some equipment has been ordered (air compressor) and other equipment already delivered (steam boiler) and some modifications in the building have already been done.

It is desired to increase the 150 tonne project to a 450 tonne project, of which 350 tonnes of fresh yeast would be dried into active dry yeast.

III. ASSESSMENT OF THE FACILITIES

3.1. Assessment of the buildings

The building foreseen for the installation of the production equipment is an old storage hall which was constructed in 1969. It measures 12 x 52 m with a total surface area of 624 m^2. The height of the walls is 4.8 m. The roof is constructed from wood and is covered with tiles. The height of the gable is about 3.5 m. The ceiling, suspended at a height of 4.8 m, is from board construction and is covered with plaster. There is natural airing of the building, attained by slashes built into the bottom and top of both side walls. At one end of the building there are two rooms without ceilings, each 5.0 x 5.6 m (28.0 m^2). At the other end there is a room 4.8 m high which measures 3.8 x 10.5 m, and a platform construction of about 20 m^2, one part of which is 2.7 m high and the other 1.4 m high.

The building is presently used for the production of rice paper. The rooms are used to store tools and for other purposes. There is no drainage system in the building. The floor is level and covered with tiles and there are some small ovens which are used for the rice paper production.

About 25% of the plaster in the walls and ceiling has fallen out, and about 50% of the tiles on the floor are damaged or have been removed. Some of the windows are broken. Little information is available, concerning the loading capacity of the building. The walls are constructed with bricks, reinforced with cement pillars, each 3.6 m high. They were intended to support only the roof, therefore, it is not possible to use them as support for any additional construction. The floor is constructed on the natural ground subsoil and could support the appropriate foundation for industrial machinery and equipment.

In its ground-plan and vertical sections the building is not ideal for bakers' yeast production, but it appears to have reconstruction potential for use as a production building of the project. In any case it is the only building available.

There is a section for the refrigeration equipment close to the production building which measures 12 x 6 m, with a surface area of 72 m^2. The air compressors will be placed in an existing building 5 meters away from the main building. The boiler is already placed in an existing building.

A platform construction for the main fermentor already exists. Differences between the final height of the fermentor and the resulting necessities for operation will be compensated for by an adequate steel construction. The fermentor will be covered by a roof to protect the workers against rain.

3.2 Assessment of the existing equipment

Equipment already exists for the production of 15 tonnes of fresh bakers' yeast per year. It consists of several tanks for the preparation and dilution of the molasses, a filter-press for the diluted molasses, 7 separators for yeast separation and washing and 3 discontinuous centrifuges to bring the yeast to about 25% D.M.S. concentration.

The separators and the molasses filter have a capacity for about 500 tonnes of yeast per year, the fermentor's capacity is only for the present production of 15 tonnes per year.

Some equipment is lacking, such as an extruder and packing machine. The existing equipment is in extremely bad condition, e.g. the molasses filter is not operating at present. The equipment used for pre-fermentation and fermentation could be considered as tanks but not as fermentors.

Most of the pipes and pumps do not seem fit for reconstruction. The air blowers appear to be in working condition, but some parts are missing, such as belts and filters. Two of the blowers have been dismounted. All 7 separators have been dismantled for repairs. Three of them are situated in the production area and four are used as a source of spare parts. The most highly movable mechanical parts were already transferred to the other three separators. Attempts have been made to get at least one separator to function using parts of all three which have been installed. This peculiar situation has arisen in the last few years, because of the lack of spare parts and tools for proper maintenance work. Altogether the condition of the existing equipment explains the fact that for more than two months the factory has not been producing yeast.

A few of the presently used equipment items seem fit for reconstruction, such as:

- four 700 litre yeast cream tanks;
- two or three pumps;
- three or four small compressors;
- some fermentors as intermediate tanks;
- the molasses filter
- three separators.

Apart from the equipment presently used for yeast production, other equipment exists which could be used for future yeast production, such as:

- two 18 m^3 acid-storage tanks of steel which should be used as main fermentors;
- some meters of stainless steel cooling coil, which is proposed to be put into the main fermentors;
- some meters of perforated tubes, which should be used for aeration in the fermentors;
- some tanks and vessels of local construction;
- pumps already ordered or delivered for several purposes;
- some tubes and installation material.

The reconstruction of the separators should be carried out in a proper, technically adequate way. All the defective parts should be replaced with original spare parts or by parts which are manufactured locally in accordance with the manufacturer's specifications.

A consistent production of yeast in the future requires a completely reconstructed yeast separator, and it is recommended to obtain the manufacturer's supervision and assistance in the reconstruction. (Manufacturer: VEB, Kuffhäuserhütte, Artern, GDR).

3.3 Assessment of the electricity, water and steam supply

Water and electric energy are supplied by the city of Hanoi. There is no steam supply, only hot water production by two water boilers (farm-type). One steam boiler (1.5 tonnes steam/hour) exists but has not been fully installed yet. Several parts of the boiler are missing such as; instrumentation, valves, damper, ventilator and others. The boiler is 14 years old and its suitability can only be determined once it has been fully installed.

The water supply is guaranteed by the city, but experience shows that there are several difficulties in the public water supply. Therefore, it is recommended to drill two or three wells to ensure the water supply needed for future yeast production.

There are two diesel generators (one 63 KVA and one 10 KVA) for emergency use during electric power cuts. Their adequacy remains to be determined once the production starts.

The drainage system is reported to be sufficient to absorb more than 500 m^3 of effluent per day. It should be observed during heavy rains.

3.4 Summary and conclusion of the assessment of the facilities

The assessment of the existing facilities reveals that the situation, especially with regard to the equipment, is very serious and that a considerable effort would be necessary to reach the aims of the project, without over-expenditure of local and UNDP funds. It was proposed that for the new project as much as possible of the following should be used:

- existing equipment from the 15 tonne plant;
- equipment collected from different places and that which is already ordered;
- existing constructions in the building and the 150 tonne engineering work.

It was concluded that in the first stage all efforts should be concentrated on implementing the 150 tonne yeast production and increasing production as much as possible in the second stage, by technological means, including dry yeast production.

It was agreed that the molasses treatment, the separation and yeast handling should be already adjusted for the 450 tonne production, although the fermentation section consisting of only one small main fermentor would not have the capacity to perform this level of production. The capacity of the active dry yeast production will basically depend on the performance of the main fermentor which, as already mentioned, is not an ideal one.

4. Technical personnel

Qualified personnel exist for laboratory work, yeast production, production control and mainterance. Most of the personnel are graduates in food engineering, mechanical engineering and biology. The majority have accumulated experience in yeast production only on a small scale unit (15 tonnes/year) using rudimentary handicraft technology. Others are experienced in other branches of the food industry. There are very few experienced in industrial yeast production because very few of the engineers had the opportunity to visit and stay in yeast factories and related industries in foreign countries, (the yeast factory in Hanoi is the only one in the country). There have been visits to factories in the German Democratic Republic and Czechoslovak Socialist Republic.

The workers, (mainly women), have work experience in the small-scale unit: mushroom; bread and noodle production. They are very diligent and it can be assumed that after a short in-plant training period they would be able to handle an industrial yeast process.

The workers in the maintenance workshop are well skilled workers, but due to the lack of relevant tools and machinery the maintenance work is not at its best.

Because some of the production and laboratory equipment was not properly purchased or installed, or not maintained due to the lack of technical manuals or training, operating difficulties exist.

5.1 Recommendations for building reconstruction

a) Construction of a sewage system within the building

The sewage should be set up in accordance with the sewage plan. The canals are closed, and should slope down to the main sewage system; they should be lined with an acid resistant material (pH 2.8) as for instance with tiles.

b) Reconstruction of the floor

Damaged or missing tiles should be replaced; if there's no possibility for repair, one part of the floor could be covered with tiles while the other part could be covered with cement. It should also slope towards the sewage system.

c) Reconstruction of the walls and ceiling

Damaged areas should be covered and painted with water resistant paint.

d) Subdivision (see also layout)

The layout of the building should be as follows:

Sector I: Molasses preparation and separation;
Sector II: Propagation and pre-fermentation;
Sector III: Main fermentation (outside the building);
Sector IV: Yeast cream storage, filtering and packing;
Sector V: Fresh yeast storage;
Sector VI: Yeast drying;
Sector VII: Active dry yeast storage.

Some parts of the subdivision already exist, such as sectors II, III and V. It has been suggested that the main fermentor be connected with the main building (sector I) with a platform which would also be connected with sector II. In the construction of this platform, the roof of the main building would be extended to cover the working platform of the main fermentor.

Some sectors need special air conditions:

Sector IV: Fresh air, +15°C
Sector V: Slow air circulation, +4°C
Sector VI: Fresh air, +20°C.

5.2 Recommendation on equipment and equipment specification

The equipment recommended is calculated for production of 450 tonnes yeast/year, for the molasses preparation and yeast separation, for a lower production for the fermentation and yeast cream storage.

The equipment specifications follow the same position numbers as in the flow sheet. Equipment to be purchased locally is marked with an "L"; equipment to be purchased from the project funds is market with a "U". Where the purchase is not already defined, "L/U" is marked. Other abbreviations used are the following:

Q:	quantity	mWS:	meter water column
BV:	volume	St:	steel
CrNi:	stainless steel	CDE:	construction design existing
Alu:	aluminium	Cu:	copper

Position	Quantity	Description	Technical Data	Funds
1	4	Molasses tank	St, BV=25m^3	L
2	1	Filter (net)	St	L
3	1	Pump for molasses	St	L
4	1	Dosing tank	St, BV=0.3m^3	L
5	1	Diluting tank for molasses	St, BV=3.5m^3	L,CDE
6	1	Intermediate tank for diluted molasses	Alu, BV=3.0m^3	L
7	1	Pump for diluted molasses	CrNi, Q=3m^3/h WS according to filter spec.	L
8	1	Filter for diluted molasses	Existing	L
9	2	Tank for filtered molasses (closed)	Alu, BV=5m^3	L
10	1 + 1	Pump for filtered molasses	CrNi, Q=2.5m^3 20 mWS	L
11	1	Cooler for molasses (plate heat exchange)	CrNi, 36,000 koal/h	U
12	1	Propagator	CrNi, BV=200 lt	U
13	1	Propagator	CrNi, BV=700 lt	L
14	1	Pre-fermentor	CrNi, BV=5m^3	L
15	1 + 1	Pump for mash	CrNi, Q=30m^3/h 20m WS	L

Position	Quantity	Description	Technical Data	Funds
16	1	Fermentor	St,Cu,CrNi,BV=23m^3 2200 ø x 5500	L
17	1	Tank for molasses preparation	CrNi,St,BV=600 lt	L
18	1	Acid dilution system		L
19	2	Dilution tanks for nutrients	BV=300 lt	L
20	1	Dosing tank for nutrients	BV=300 lt	L
21	1	Dosing tank for nutrients	BV=300 lt	L
22	1	Pump for nutrient solution	Q=1m^3, 10 WS	L
23	1	Filter for nutrient solution (net)		L
24	1	Separator for yeast	CrNi, 30m^3/h	L
25	1	Separator for yeast	CrNi, 30m^3/h	L
26	1	Separator for yeast	CrNi, 30m^3/h	L
27	1	Intermediate tank for yeast	CrNi, BV=70 lt	L
28	1	Pump for yeast cream	CrNi, Q=15m^3, 5M WS	L
29	1	Intermediate tank with agitator	Slu, BV=4m^3	L
30	1	Intermediate tank with agitator	Al., BV=5m^3	L
31	1	Yeast cream pump	CrNi, Q=3m^3	U
32	1	Cold water storage		L
33	1	Cooler for yeast cream (plate heat exchanger)	CrNi, 50,000 koal/h	U
34	1	Yeast cream tank	CrNi, BV=3m^3	L,CDE
35	1	Yeast cream tank	CrNi	L,CDE
36	1	Yeast cream tank	CrNi	L,CDE
37	1	Yeast cream pump to filter		L/U
38	1	Filter press for yeast complete with washing machine		L/U
39	1	Extruder	(still in discussion)	
40	1	Cutting unit	(still in discussion)	
41	1	Packing machine	(still in discussion)	L/U
42	6	Transport vessels	CrNi, BV=360 lt	L

For active dry yeast production

Position	Quantity	Description	Technical Data	Funds
43	1	Grinding machine	CrNi	U
44	1	Dryer for yeast	CrNi, 50kg ADY/h	U
45	1	Transport unit	CrNi	U
46	2	Tanks for ADY	CrNi	U
47	1	Packing/sealing machine		U

For auxiliaries

50-a*)	1	Refrigeration unit for wet yeast production	180,000 koal/h	L
50-b*)	1	Refrigeration unit for ADY	180,000 koal/h	L
51	1	Tank for ice water (-5°C)		L
52	1	Tank for cooling water (15°C)		L
53	1	Ice-water pump	$2m^3$, 15 mWS	L
54	1	Cooling water pump	$20m^3$, 15 mWS	L
55	1	Tank for process water	St, BV=$20m^3$	L
56	1	Tank for hot water	St, BV=$10m^3$	L
57	1	Pump for washing	St, Q=$50m^3$, 30 mWS	L
58	1	Tank for anti-foam agent, including anti-foam regulator	Plastic	U
59				
60	1	Air blower, complete with filter and oil separator	Q=1200 Nm^3/h 8 mWS	L
61	4	Air compressor (complete)	Q=36 Nm^3/h	L
62	3	Air compressor (complete)	Q=20 Nm^3/h	L

*) If there is only <u>one</u> unit for wet yeast and ADY-production instead of 360,000 koal/h, a 330,000 koal/h unit will do.

6. Training programme

a) The purpose of the training programme is to increase the technical expertise of the personnel for industrial-scale yeast production, production control, and maintenance of the existing and future equipment. Furthermore, they need to be able to solve the problems of reconstruction and erection of yeast production facilities in terms of the requirements of building, piping, waste water disposal, handling and infrastructure.

b) The training programme consists of both in-plant and out-plant training.

c) In-plant training was already started during the first visit of the CTA. Some aspects of industrial yeast technology, equipment and building construction, and production control have already been explained. This training should be continued during future visits of the CTA and by other consultants to be assigned to the project. Also some yeast production literature (books, articles, etc., dealing with relevant problems) should be provided by the project funds to complete the volume of information. During the erection and start-up of the plant, the local technical personnel will be trained with the close cooperation of the CTA and consultants.

d) Out-plant training will consist of a group study tour and fellowships. Once the nomination forms are filled out by the candidates and forwarded to UNIDO, UNIDO will start to organize the study tour and the fellowship programmes. Contacts with institutes and industries in India and Cuba already exist. The study tour should be organized as soon as possible and the training applied to the construction of the new production facility. Experience shows that a study tour takes about three to four months to organize, which means that a tour could start at the end of August or beginning of September this year at the earliest. Any further details concerning the study tour (countries and companies to be visited and dates) will be delivered to the counterpart as soon as they are available, via the UNDP office in Hanoi

In the case of fellowships, it is proposed to focus on two fields: general yeast production and production control; and maintenance of equipment and production of spare parts.

7. Future project activities

Local project staff will execute, within the next four months, the engineering work for the reconstruction based on the new process documents. The engineering work will consist principally of:

- a piping scheme, including instrumentation;
- construction design for local equipment;
- construction design for auxiliary supplies (water, electricity);
- design for the building reconstruction by modifications to the existing design, according to the new process.

A time schedule for the future work to be carried out within the project is attached as Annex XIII. It is foreseen to proceed with the project in accordance with this work plan.

The study tour should be carried out in the third quarter of 1983, and be accompanied by a bakers' yeast technologist. (If possible, the engineering work should be finished before starting the study tour, and this should be discussed during the study tour with the yeast technologist. The final discussions on the engineering work should be held in Vienna at the end of the study tour). The fellowships should start in 1984: the mechanical one should end before the installation of the equipment; the technological one a month before the test-run begins.

The consultants and CTA should be appointed during the project's preparation and construction phase only for advisory purposes with regard to the engineering work at the beginning and end of the equipment installation, to make sure that at the end of the project there is enough time available for a test-run and final-run and in-plant training. Contacts should be maintained every six months for project meetings for the discussion of progress and problems.

8. Conclusion

The existing production unit is in worse condition than expected, and a large expenditure on construction and materials will be necessary to reach the aims of the project.

With respect to local conditions and circumstances and to reach the aims of the project, it was agreed that all efforts will be undertaken

to reconstruct the existing equipment and construct new equipment wherever possible with local funds, reserving project funds for specialized equipment, particularly the active dry yeast production equipment. UNDP support should be in the form of spare parts for existing equipment and for some equipment which could be provided locally only with extreme efforts.

With regard to the training programme, one of the main subjects should be the maintenance of equipment, to guarantee consistent yeast production in the future.

ANNEX I

UNITED NATIONS

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNIDO

22 October 1982

Project in the Socialist Republic of Viet Nam

JOB DESCRIPTION

DP/VIE/80/040/11-01/31.7.C.

Post title Bakers' Yeast Technologist (Chief Technical Adviser).

Duration Two months, additional six months at a later stage.

Date required As soon as possible.

Duty station Hanoi.

Purpose of project To assist in modernizing and increasing the production of the bakers' yeast, required by bakeries in Hanoi and neighbouring provinces.

Duties In close co-operation with the Hanoi People's Committee, National Project Director and the management of the company for processing wheat flour TUONG MAI, the expert is expected to:

1. Make an assessment of the existing bakers' yeast facilities:
   - building condition its suitability for reconstruction and adaption
   - existing equipment, its condition, capacity, suitability for reconditioning and future use
   - electricity, water and steam supply, capacity and regularity of supply
   - technical personnel, their qualifications and experience relevant to the production of yeast.
2. Prepare:
   - flow sheet and lay-outs for the technological process and equipment
   - final equipment specification for the equipment ..../..

which is to be provided from the project funds as well as for the equipment which is available or should be made locally

- general design for installations, electricity, water and steam mains etc.

- programme of training and study tours for the technical personnel of the plant.

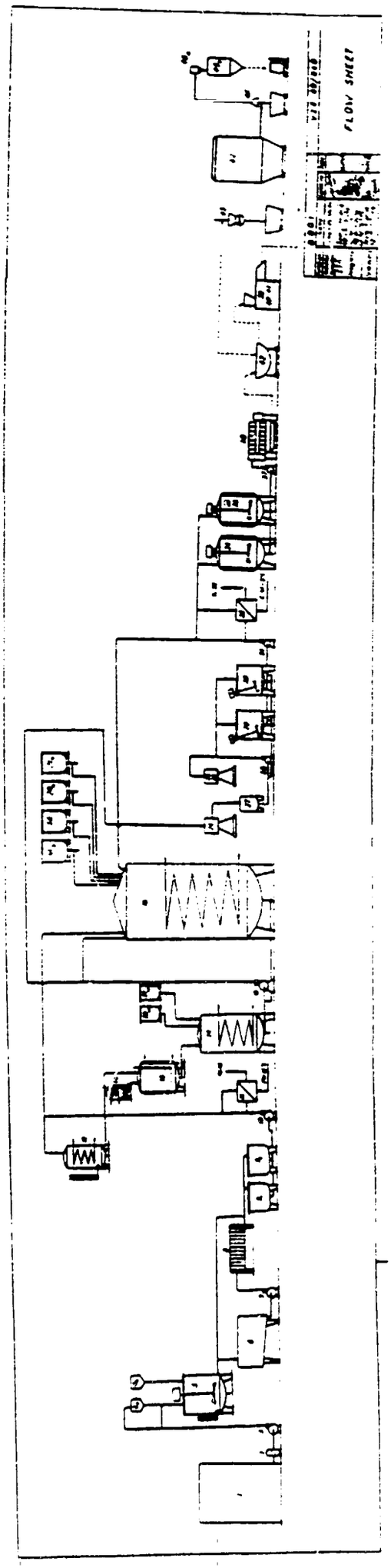
The expert will also be expected to prepare a final report, setting out the findings of the mission and recommendations for further action to be taken. It is envisaged that once the equipment has been delivered, the same expert will be engaged for a period of six months to supervise installation and initial operation of the plant, including civil works, reconditioning of the existing equipment, etc.

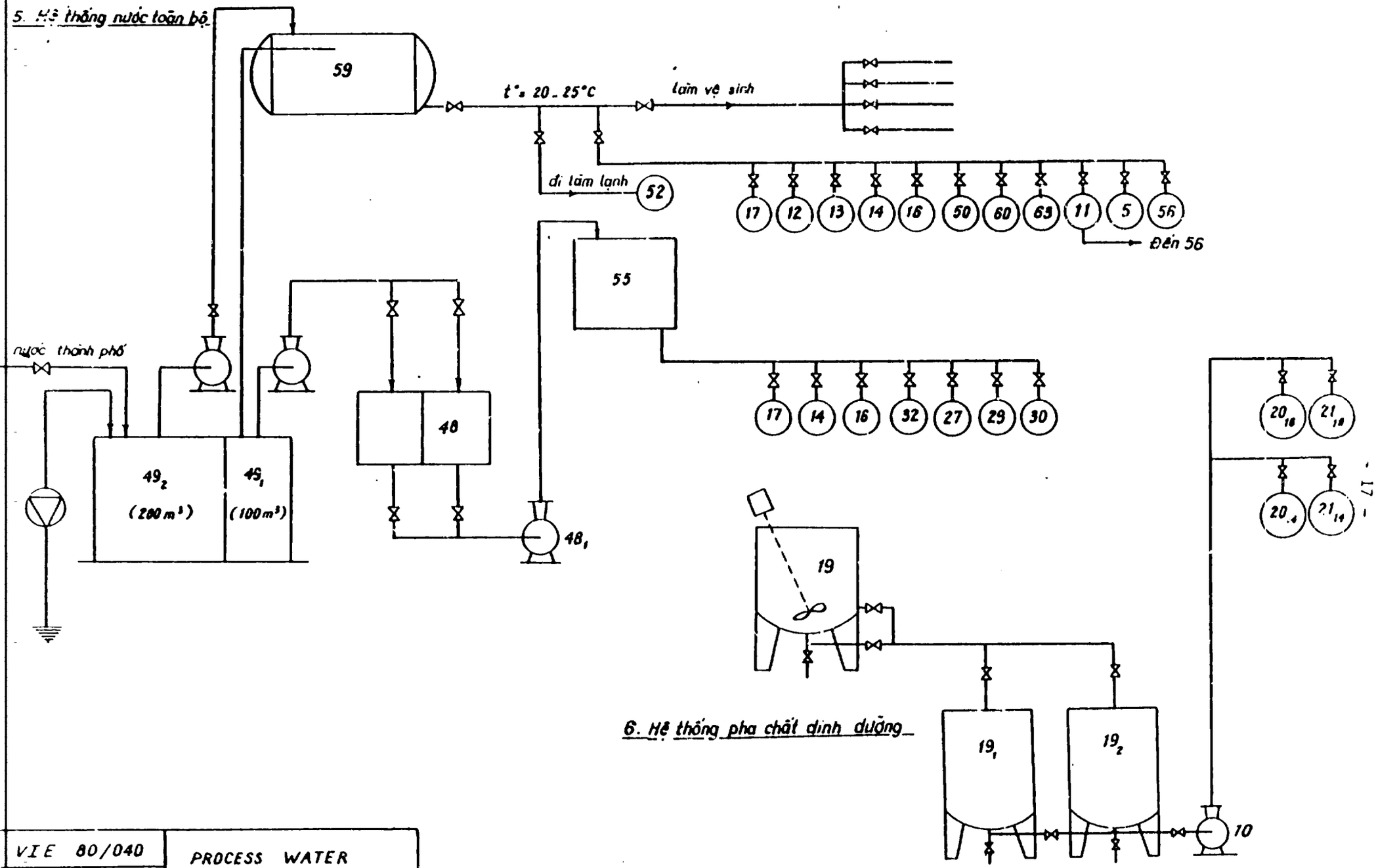
Qualifications — Highly qualified bakers' yeast technologist with extensive practical experience in the establishment of bakers' yeast plants, selection of equipment, its installation and operation.

Language — English.

Background Information — The bakers' yeast plant of the "Company for processing wheat flour TUONG MAI" attached to the "Food Service of Hanoi" is located in the outskirts of the city of Hanoi. The existing plant represents a small unit producing some 15 tonnes of yeast per year. By 1985 the indicated demand for bakers' yeast will amount to some 250 tonnes of dry yeast annually or equivalent to some 900 tonnes of wet compressed yeast. In order to meet the demand, at least of the city of Hanoi and its four neighbouring provinces, the production should increase to some 450 tonnes of wet yeast of which 350 tonnes may be used for the production of 100 tonnes of dry active bakers' yeast.

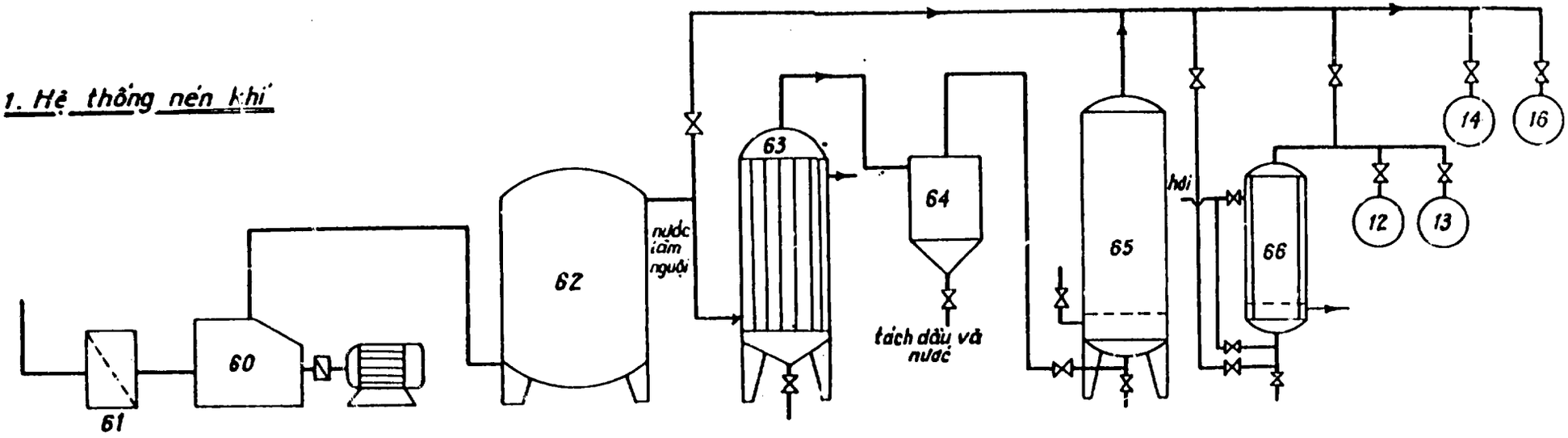
The present production facilities represent a small scale operation using simple technology and equipment, and may serve both for training purposes and as a base for future expansion. The sugar plant VAN DIEM, located some 25 km from Hanoi is able to supply all the molasses required. The molasses available have some 44.3 percent of saccharose and invert sugar which is lower than in some other sugar industries. All nutrients and additives used in bakers' yeast production are available in the country. The ultimate aim is to produce 450 tonnes of wet yeast of which 100 would be used as such, while 350 tonnes would be processed into dry active yeast. Dry yeast production should be considered as the second stage which will depend on the project funds and availability of Government inputs. Five man months of consultancy services are also included in the project budget of which 3 man months will be used for the equipment installation and two man months for a training programme. Individual fellowships and study tours are also envisaged. More detailed information on the project, locally available equipment, preliminary list of equipment to be provided within the project etc., will be put at the expert's disposal at the time of his briefing. The expert may be required to establish contacts with some equipment manufacturers, existing bakers' yeast plants and training institutions.


FLOW SHEET

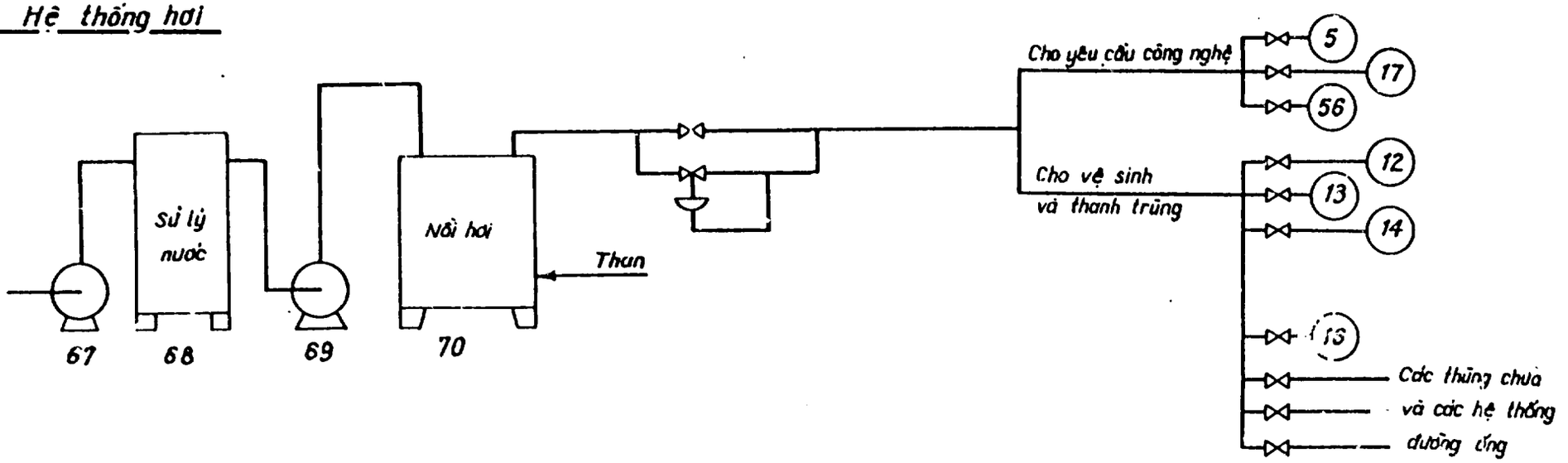


VIE 80/040	PROCESS WATER
D C C 4 .	NUTRIENT SUPPLY

1. Hệ thống nén khí

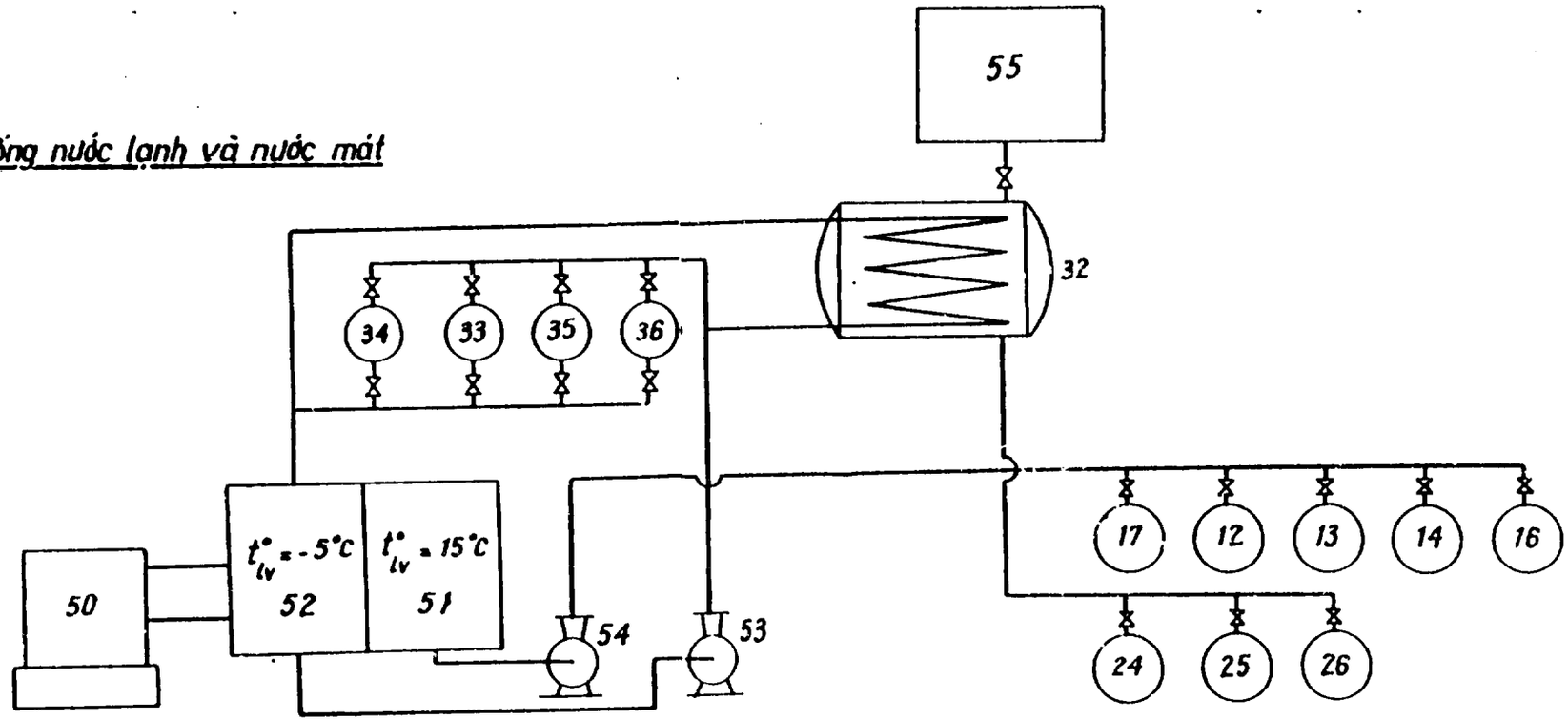


2. Hệ thống hơi



VIE 80/040	AIR SUPPLY
D002	STEAM SUPPLY

3. Hệ thống nước lạnh và nước mát



4. Hệ thống nước nóng

VIE 80/040	ICE.WATER AND COOL WATER SUPPLY
D 003	HOT WATER SUPPLY

PROCESS DESCRIPTION ANNEX III

Batch fermentation technology is applied to the yeast production, a form of the "Aulaufverfahren" adapted to local conditions.

1) Media and Nutrients Preparation

The main source of Carbohydrate for yeast production is from cane molasses, the Nitrogen fro $(NH)_4$ SO or Urea and P_2C_5 from super-phosphate. Each of those materials should be properly treated before using.

Molasses: The acid heating method for sterilization and for decantation of colloids and sludges. Molasses is pumped (3) to dosing tank(4) and from there it flows to molasses treatment tank (5). In this tank, molasses is diluted, pH adjusted by H_2SO_4, heated directly by steam, agitated and kept at 90 - 95° C. Then, it is left for decantation, filtered and cooled before using.

Super phosphate: This is mainly a compound of soluble Ca(HPO) and insoluble $CaSO_4$. In general we prepare a part of super phosphate quantity together with molasses in (5) for a good decantation. The main part is diluted with water and added to the fermentation.

Urea and (NH_4) SO_4 the fertilizer type is used, so it needs to be diluted heated and filtered before using in the fermentation.

2) Fermentation

Sacch-Cerevisae process is used for yeast production. Beside the main requirements of Carbohydrate, Nitrogen, Phosphorus, etc., there is also a need for some essential minerals like Magnesium, Potassium, etc., and some stimulus consisting chiefly of B vitamins. These minerals are more or less available in molasses, and are usually added more during the propagation in the laboratory.

Yeast strain is purely and properly cultivated in the laboratory, and then in pure propagation (12,13) and pre-fermentation (14,16). To obtain a satisfactory sterilization, besides sterilizing the pipe-system and the equipment, the pH must be low, and the air must be filtered before using.

In different stages of fermentation, the required time may be different but the temperature is constantly kept at 28 - 32°C.

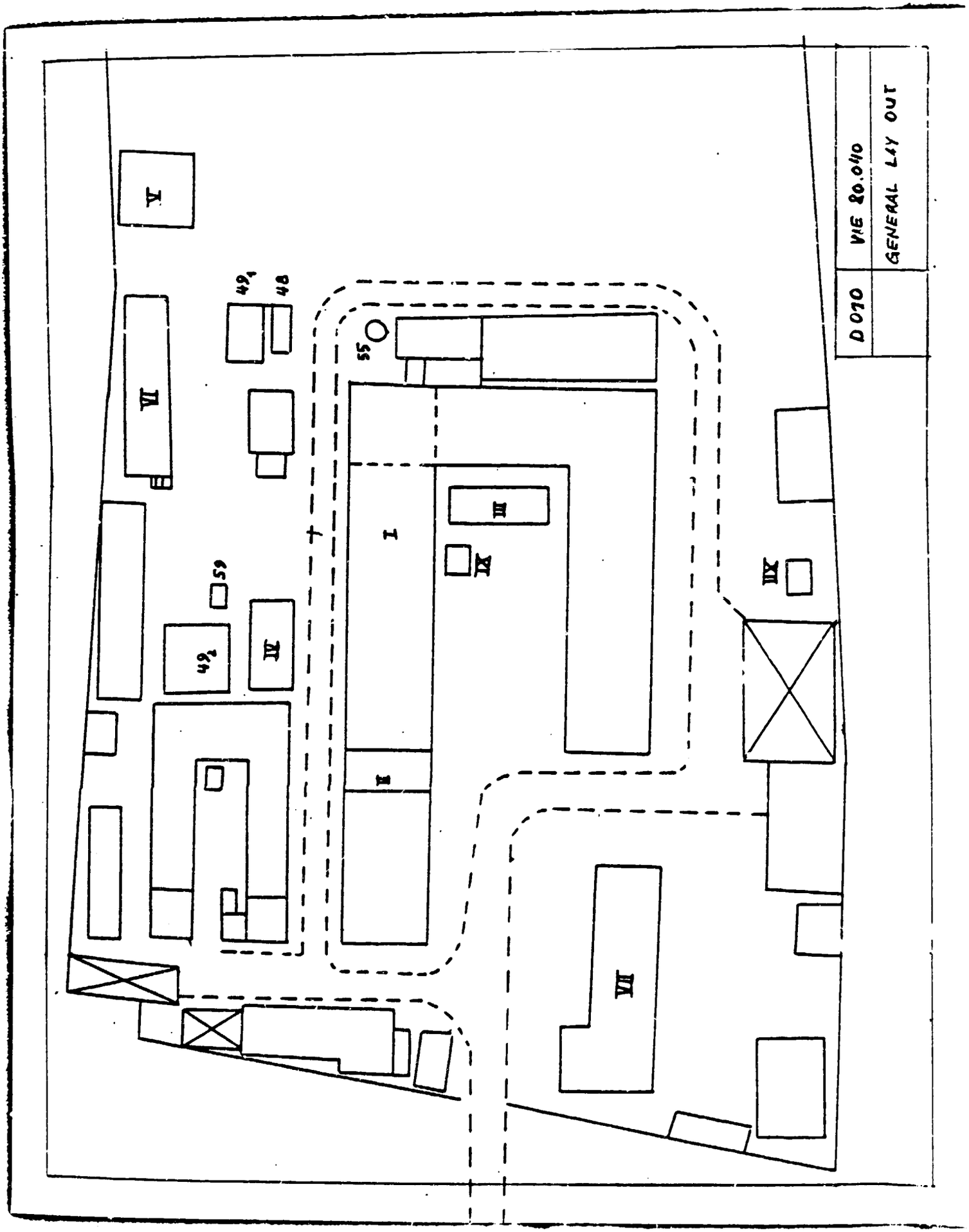
The pre-fermentation is used as inoculum for the first main fermentation (mother or seed yeast production). The subsequent main fermentations are inoculated with seed yeast. All main fermentations are separated and washed twice. The yeast cream is cooled to a 4°C and stored at this temperature in the yeast cream storage.

3) Wet yeast production

The yeast cream is "pressed" in a filter press to about 28 - 30% DMS. The pressed yeast is packed in 20 kg bags and kept in the storage room until its delivery to the bakeries.

4) Active dry yeast (ADY) production

For the production of ADY the pressed yeast is first granulated and then dried in a fluid bed dryer. The yeast is dried to about 90-92% DMS: The dried yeast is pumped to a storage tank, from which it flows to the packing and sealing machine to be packed in 20 kg bags.


D 070
VIE 80.040
GENERAL LAY OUT
I
II
III
IV
V
VI
VII
VIII
IX
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59
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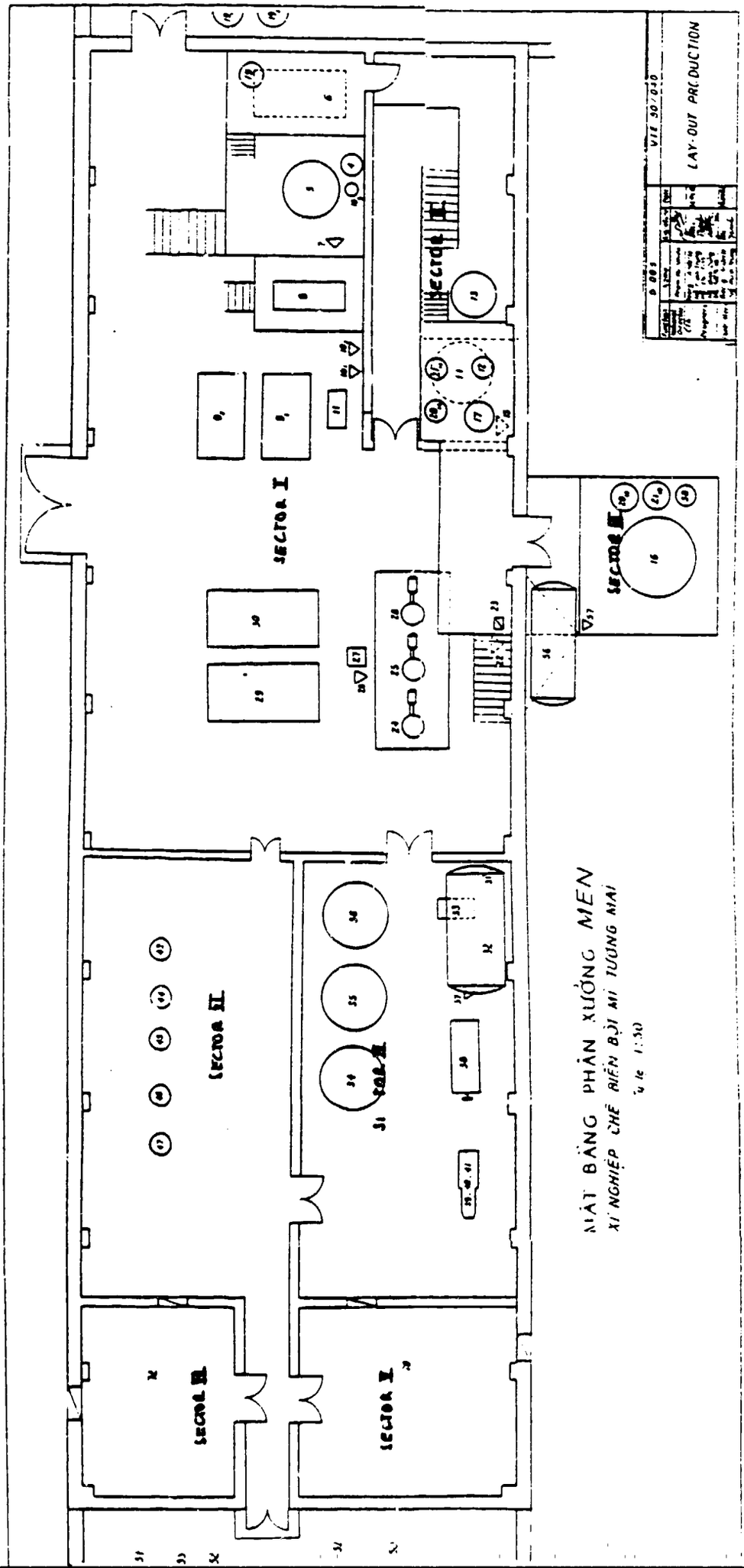
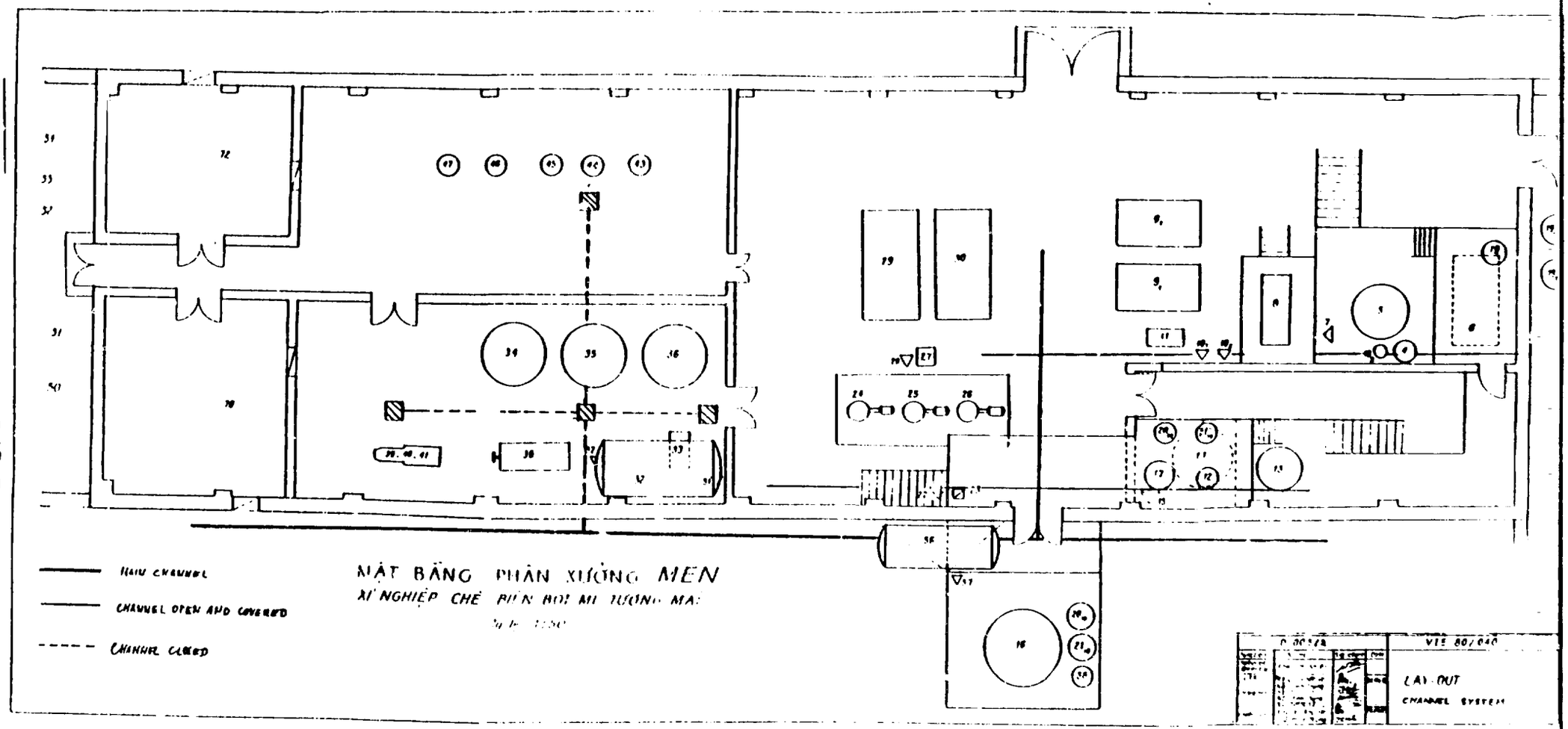
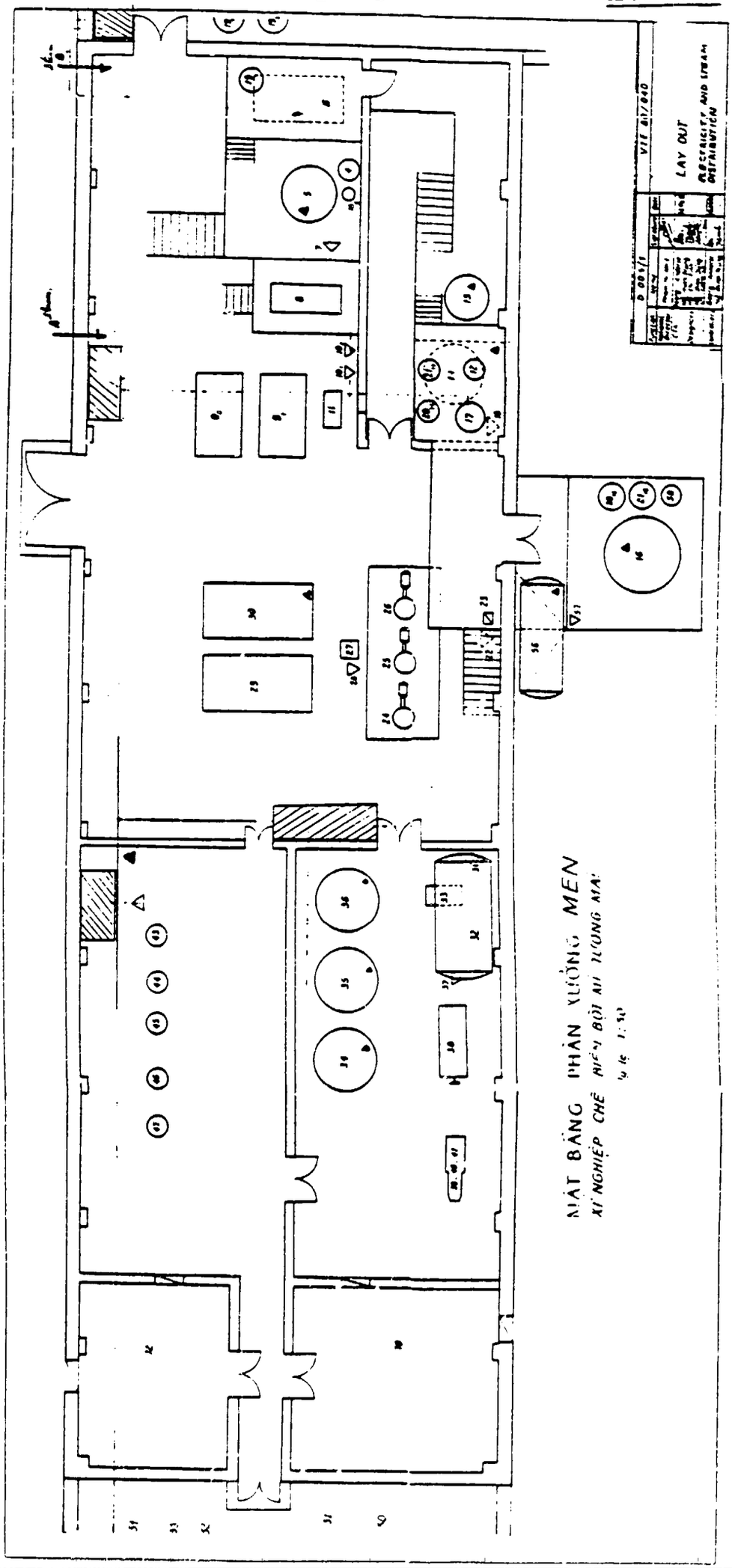
49₁
49₂

ANNEX V


LAY-OUT PRODUCTION
SECTOR I
SECTOR II
SECTOR III
SECTOR IV
MẶT BẰNG PHÂN XƯỞNG MEN
XÍ NGHIỆP CHẾ BIẾN BỘT MÌ TƯƠNG MAI


MAIN CHANNEL
CHANNEL OPEN AND COVERED
CHANNEL CLOSED
MẶT BẰNG PHÂN XƯỞNG MEN
XÍ NGHIỆP CHẾ BIẾN BỘT MÌ TƯƠNG MẠ
LAY-OUT
CHANNEL SYSTEM

ANNEX VII



MẶT BẰNG PHÂN XƯỞNG MEN
XÍ NGHIỆP CHẾ BIẾN BỘT NƯỚNG MẠ

COMMENTS ON SECOND HAND EQUIPMENT

1. Introduction

Several months ago a 500 tonnes/year bakers yeast factory in Bludenz/Vorarlberg-Austria was closed down, because the yeast production was transferred to a bigger already existing facility. Most of the equipment was offered for sale. During a recent visit of the CTA of the project, a short assessment was made of the existing equipment and an evaluation of its suitability for the present project.

2. Existing equipment

Much of the equipment which would be of interest to the project, such as a vacuum filter, extruder, packing machine, are already sold. The following is still available:

- several iron molasses tanks and pumps;
- several stainless steel vessels, some of them still with agitator, capacity 2 m^3 to 3.5 m^3, approximately Austrian Schillings 50,000 each, depending on the size and additional equipment;
- several pumps (two for Austrian Schillings 30,000)
- one propagator, 200 lt, from stainless steel, with agitator;
- one main fermentor with Vogelbusch aeration device, Volume 40 m^3, stainless steel, approximately Austrian Schillings 200,000;
- air blower for 1400 Nm^3
- piping and installation material, consisting of about 25 - 30 m stainless steel pipes, ϕ 25 - 80 mm, fittings, and approximately five valves, price estimation Austrian Schillings 40,000.
- three separators, Westfalia 1965, capacity about 25,000 lt mash/hour, price Austrian Schillings 60,000 each;
- different laboratory equipment such as a microscope 1960 price Austrian Schillings 2,000, a laboratory centrifuge Austrian Schillings 500 and other equipment.

3. Condition of the equipment and suitability for the project

The equipment is old but seems to be properly maintained and is considered to be in good condition. Most of the equipment still

available is that which should be provided locally such as the vessels, pumps and pipes and the separators.

As already mentioned in the report there are difficulties to obtain stainless steel material in Viet Nam and, therefore, if the project funds are sufficient, the purchase of some stainless steel equipment should be considered. In addition, some laboratory material such as a microscope and centrifuge for use in direct production control could also be purchased. Some large equipment, such as the main fermentor seems to be suitable for the project, but because of problems of dismantling and assembling, they may not be considered for the project (there is nobody who could supervise the dismantling of the equipment in the factory in Bludenz and assembling in Hanoi).

4. Conclusion

Equipment which would be of interest for the project has already been sold with the exception of a few items such as the anti-foam system and the propagator. The decision to buy this equipment should only be taken after the prices have been compared with new equipment.

The rest of the equipment available is that which is to be provided locally. If there is a problem with the local supply, purchase of the second hand equipment could be considered. However, large equipment (such as the main fermentor) should not be considered, because there is nobody available to supervise the dismantling and assembling.

ANNEX IX

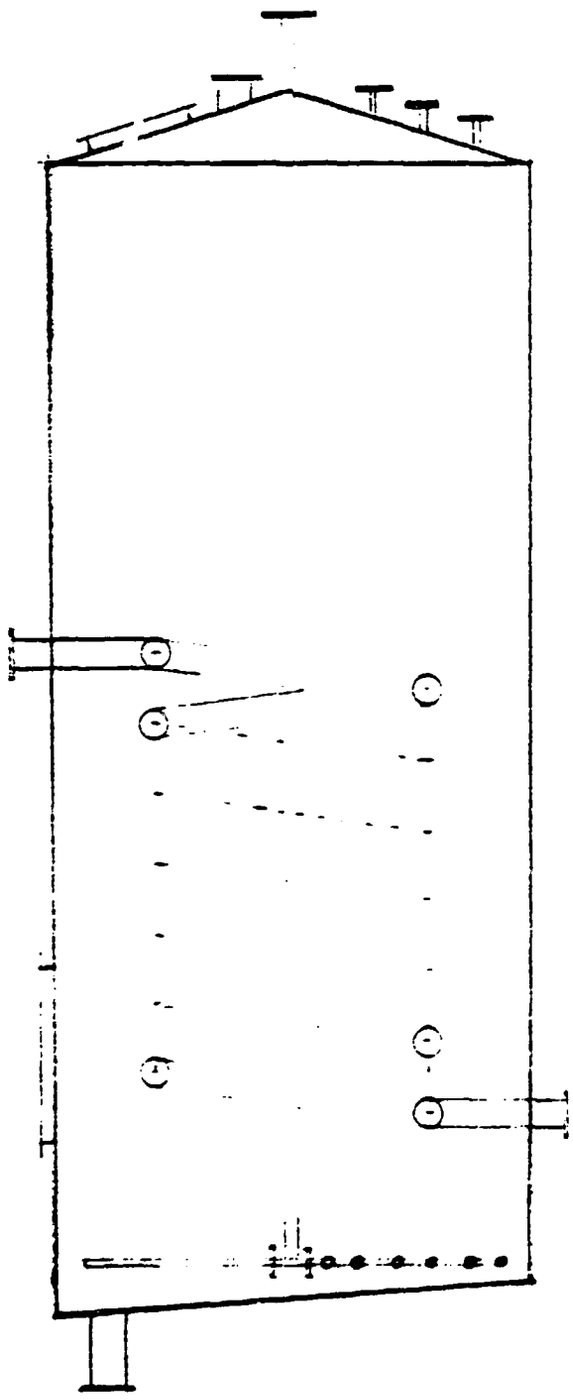
COMMENTS ON MAIN FERMENTER

A project to transform an existing acid storage tank into the main fermenter exists. Based on this project, the new fermenter has been designed. In principle, it is possible to execute the work according to the existing design, but some changes should be considered in order to improve the performance of the fermenter. According to the design, the following should remain:

- the aeration system (1mm holes, outlet on the bottom of the tubes, tubes flexible);
- velocity of air outlet at 25 m/sec.

The following changes should be considered:

- an increase of the height from 6.5 to 7.0 meters;
- refrigeration - there should be a minimum space between the aeration tube and refrigeration tube of 0.5 m; the refrigeration coil should not be higher than 65% of the total fermenter height. The refrigeration should be calculated to remove at its maximum 120,000 Kcal per hour;
- painting - the fermenter should be painted inside by an acid resistant solution and outside by a weather resistant one; the acid resistant solution could be provided by the project funds if it is not available locally;
- inside welding and construction - it should be taken care that both the welding and construction is smooth and easy to clean and sterilize.



	VIE. 80 04 C
	PREFERMENTER

Exler Fiedler 1090 Wien (A4/MR)

SPECIFICATION OF THE PREFERMENTOR

HEIGHT:	3200 mm
DIAMETER:	1400 mm
REFRIGERATION:	2.0 m^2
AERATION SYSTEM:	1500 holes 1 mm ϕ
AIR:	Normal condition, 100 Nm^3/hour
	Maximum 200 Nm^3/hour

PRODUCTION CONTROL ANNEX XI

A) All analyses relating to the production control will be executed in the laboratory of the yeast factory. The maintenance of the yeast strain and the propagation of yeast also come under the duties of the laboratory. Special analyses will be made in the research institutes of the Hanoi University.

Analyses to be executed by the laboratory:

Molasses
- concentration
- pH
- sugar content
- bacteriological examination

Mash
- concentration
- concentration of yeast
- pH
- alcohol
- unfermented sugar
- bacteriological examination

Yeast
- bacteriological control
- activity (factory method)
- dough activity (factory method)
- nitrogen
- PO_4^{3-} (or P_2O_5)

The following analyses should also occasionally be made:

- bacteriological content of the raw materials;
- process water.

For most of the analyses there is sufficient equipment already existing, which should be suitable also for the future production; some of the equipment should be cleaned, maintained and repaired.

From the project funds should be purchased:

- Electrode for the existing pH-Meter (pH-Meter, Gki-CEL Lic. Polymetron, Tipo 39/8, Spain);

- Laboratory centrifuge;
- Alcohol determination unit;
- Cuvette for colorimeter (or alternative method and equipment for PO_4^{3-} determination).

Chemicals: There exists a big stock in chemicals in the laboratory; still, there are some missing which should be purchased such as:

- Fuchsin
- Methyl blue
- Agar-Agar
- Congo red.

Glassware already exists; it can be provided locally without difficulty.

B) Layout of the laboratory

In the layout of the laboratory, it was decided to place it in two rooms: one for the biological analyses and propagation works; the other for chemical analyses. A water system has already been installed. Some repair work on the ceiling and walls and some painting are necessary. Air conditioning for the laboratory or at least for the inoculation room would be advisable.

C) The laboratory employs one chief, one biologist and one chemist. The personnel are qualified and experienced in laboratory work and biological and chemical analyses. Some training on equipment maintenance would be helpful.

SUMMARY OF PROJECT ACTIVITIES ANNEX XII

AND EQUIPMENT TO BE PURCHASED FROM THE PROJECT FUNDS

1) Delivery of information material:

- final report on CTA-visit, including statements on main fermentor, prefermentor second hand equipment;
- literature on yeast and yeast production;
- information on study tour.

2) First delivery of equipment, consisting of:

a) Equipment for production:

- 1 hand-pump for conc. sulfuric acid;
- 3 acid tanks, 15 lt., plastic;
- 1 propagator, 200 lt., CrNi;
- 1 cooler for molasses, including spare parts;
- 1 yeast cream pump (mono) including spare parts;
- 1 cooler for yeast cream including spare parts;
  (1 yeast cream pump for filter press)
  (1 filter press)
- installation material;
- 1 anti-foam unit including spare parts;
- 1 rotameter for molasses including spare parts;
- eventually some other missing essential spare parts, second-hand equipment and installation material.

b)
- 1 centrifuge;
- 2 electrodes for pH-meter;
- 1 alcohol distillation unit;
- 2 cuvettes for colorimeter (or alternative method and equipment for PO_4^{3-} determination).

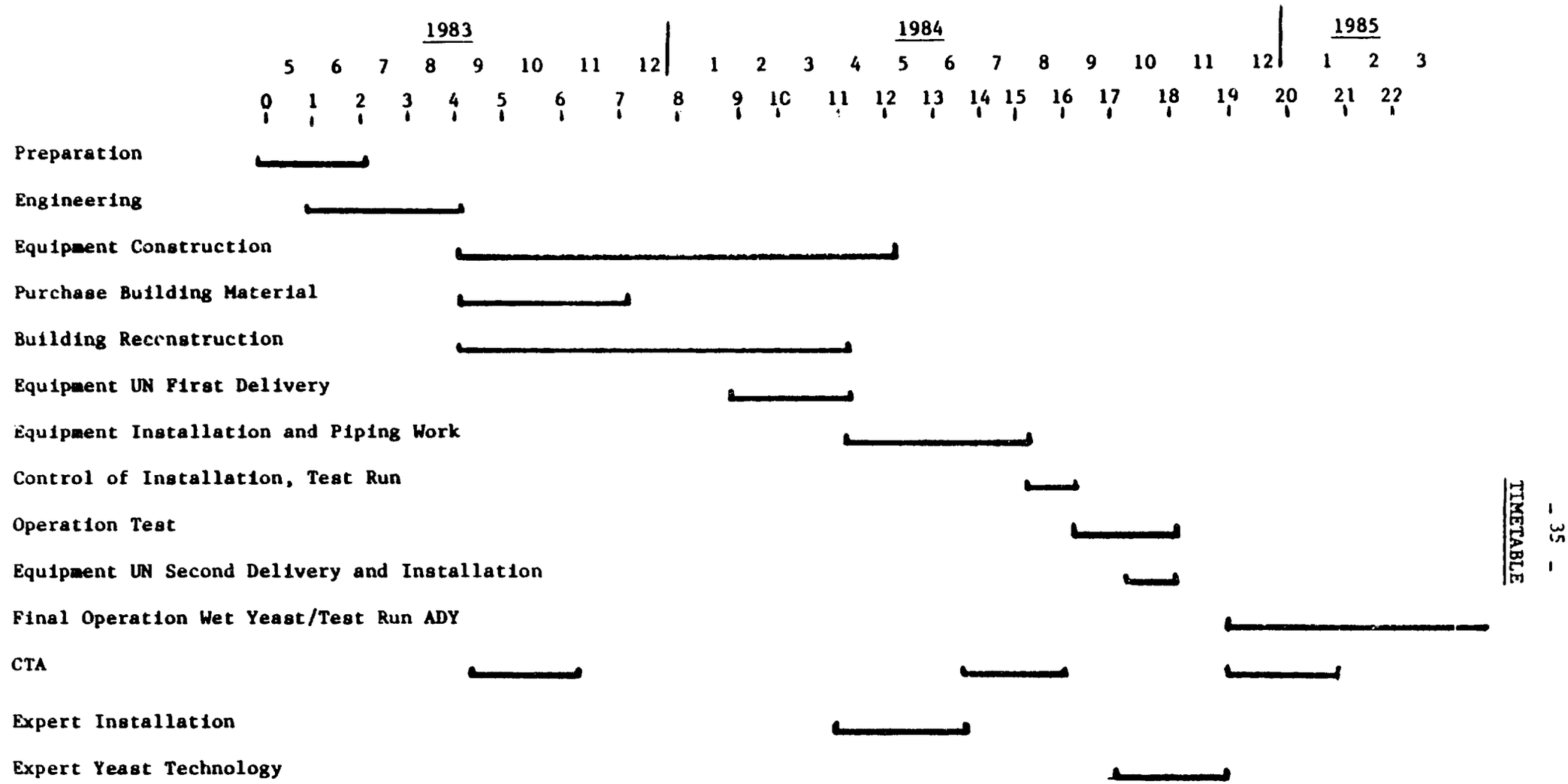
c) Chemicals:

- Anti-foam agent (approx. 100 kg);
- Biotin (approx. 1000 g);
- Mg-sulphate (approx. 20 kg);
- Fuchsin (1 flask, 100-250 ml);
- Methyl blue (1 flask, 100-250 ml);
- Agar-Agar (approx. 2000 g);
- Congo red. (1 flask, 50 g).

3) Second equipment delivery, consisting of:

- additional installation material;
- ADY (Active Dry Yeast) - production equipment, including: grinding machine, dryer, transport unit, ADY-storage and packing.

TIMETABLE


1983
1984
1985
5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
Preparation
Engineering
Equipment Construction
Purchase Building Material
Building Reconstruction
Equipment UN First Delivery
Equipment Installation and Piping Work
Control of Installation, Test Run
Operation Test
Equipment UN Second Delivery and Installation
Final Operation Wet Yeast/Test Run ADY
CTA
Expert Installation
Expert Yeast Technology