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DP/ID/SER.A/897
7 September 1987
English

16500

PRODUCTION OF BAKER'S YEAST IN HANOI

DP/VIE/80/040

THE SOCIALIST REPUBLIC OF VIET NAM

Technical report: Start-up operation of the baker's yeast plant*

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

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Vienna

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INTRODUCTION

According to the job description, the main duties of the consultant were:

- to assist in the installation and start-up of equipment for wet and active dry yeast production;
- to train local staff in the techniques of wet and active dry yeast production and maintenance of equipment.

The duration of the assignment was two months as of April 1987 and coincided with the assignment of the Chief Technical Adviser, Mr. G. Anderle. Both of them left Hanoi on 27 May 1987.

In addition to assisting in the operation of equipment and solving various technical problems the corsultant delivered several lectures to the counterpart staff on bakers' yeast technology and participated in various project related meetings.

FINDINGS AND ACTIVITES

Following the assessment made at the beginning of the assignment, several important conclusions were reached and observations made:

a) inadequate quality of raw material:
   - high infection due to undesirable fermentation of molasses resulting in high concentration of toxic substances which inhibit the activity of the bakers' yeast population, such as acetic acid, butiric acid, etc.;
   - process water contains inpurities and is highly infected, not corresponding to the drinking water purity (no pre-filtration), it is in principle not suitable for bakers' yeast production;
   - superphosphate had fertilizer quality and higher concentration in the substrate showed the negative influence on the yeast production;

b) local staff had initially no experience and adequate qualification for the work in high technology of active dry yeast production;

c) technical documentation for some old and new equipment was incomplete; maintenenace of equipment is not up to the desired level;

d) incomplete microbiological laboratory (equipment and chemicals) and laboratory staff was not adequately qualified.

Under these circumstances, no regular production could be carried out during the period of assignment. Following an agreement reached with the CTA and the plant management, it was decided to simulate a production process with the purpose of testing equipment and practical training of the production personnel.

At the beginning of his assignment, the consultant prepared, in co-operation with the CTA, a set of technological data sheets for normal grade molasses and for the preparation of various chemicals (see Annex I). These were discussed in detail with the plant management.

On 14 April, substrate preparation was initiated, on a laboratory scale, with the prupose of propagation of pure culture in 250 ml and 2,000 ml Pasteur flasks. Due to low quality of molasse, the work was carried out with pure sucrose solution as well. One of the difficulties was created also by unstable electricity voltage resulting in different values shown by laboratory instruments (pH-meter).

On 15 April, first sterilization of the Pasteur flasks was carried out. Since the steam regulation of the autoclave did not function and there was no temperature control, carbonization of sugar in the flasks took place. On 17 April, it was decided to delay production tests for one week until coding machine and air compressors are operational, as well as translation of technical documentation is completed.

During that period, theoretical training of the plant personnel (particulary of Tuang Mai) was initiated and carried out in: yeast strain propagation, molasses storage and preparation, preparation of nutrients, supervision of the fermentation process, calculation of nutrients' requirements, separation with Westfalia type separators, determination of nozzle until yeast filtration, etc. Parallel to the training, samples of nutrients solutions were made in the laboratory and their concentration and purity was determined, the same was done to control nutrients' solution prepared in the plant.

On 22 April, the analyses results for process water, made by the Hanoi Institute, were received (Annex II), they indicated high microbial infection (E. Colli, Clostridium) and NO_2 concentration (up to 0.96 mg|lit) which inhibits yeast growth. The suggestion to introduce water treatment by filtration and sterilization was accepted however, it was not realized until the consultant's departure.

On 24 and 25 April, inocculation and prefermentation was carried out. On 27 April, molasses and pure culture vessel (BV 500 lit) preparation was initiated. Due to inadequate quality of process water, cooling water was used, there were problems with the air blower. After 20 hours of fermentation process, prefermentation, without aeration, started. Since there were problems with the air filter at the main fermentor, main fermentation was delayed by 20 hours and this led to yeast autolisation.

On 30 April, the fermentation with the main fermentor, at only 30% of its capacity, was initiated. Because of leakage in the air filter, most of the air was lost. After 8 hours of fermentation, as a result of wrong manipulation by an operator, 15 lit of antifoam went into mash. For this reason, the fermentation process was interrupted and separation took place. Following the laboratory control, the plant management decided to use the yeast which was produced in the bakery.

The second production test started on 6 May and the results were better than those from the first test however, quality was not sufficiently good for the dry yeast process. The laboratory analyses results were as follow:

- 36.7% protein
- 2.3% P_2O_5
- high microbial infection.

The two test runs indicated above confirmed what was mentioned before that without improvement it would practically be impossible to produce good quality active dry yeast (ADY).

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TECHNOLOGICAL DATA SHEET

MOLASSES PREPARATION

Molasses preparation tank: gross volume - 4.000 l
net volume - 3.200 l

(i) 900 l hot water (45 cms)

(ii) agitator On

(iii) 2.400 l molasses 60° Bg, or adequate quantity depending on concentration (120 cm)

(iv) steam, cooking for 30 minutes at 90° C

(v) pH adjustement with sulfuric acid, range 4.6 - 4.8

(vi) sedimentation for 6 hours

PREPARATION OF CHEMICALS

Purpose: preparation of solutions of chemicals suitable for the use in the process

a) Sulfuric acid

There will be a prepared a 1:17 dilution in the acid dilution tank.

(i) water

(ii) concentrated acid

b) Nutrients (Urea, DP and AS) will be diluted with hot water in the dilution tank for a 20 % solution in the quantities required for each fermentation. Depending on the quality of the material sedimentation of about 2 hours might be necessary.

Nutrient requirement:

(i) for mother yeast fermentation

UREA	24	kg	120 l
DP	24	kg	120 l
AS	55.5	kg	280 l

(ii) for yeast fermentation

UREA	15	kg	75 l
DP	21	kg	105 l
AS	34	kg	170 l

YEAST PREPARATION

Propagation tank: Total volume - 500 l
net volume - 400 l

(i) water 250 l (65 cm)
(ii) molasses 100 l 60° Bg (28 cm)
(iii) nutrients 160 g DP, 50 g AS, H_2SO_4 to pH 45
(iv) sterilization 2 hours at 90° C
(v) cooling to 30° C
(vi) inocculation with laboratory culture (Pasteur)
(vii) preparation is finished after about 16 to 18 hours, when °Bg is not decreasing anymore.

PREFERMENTATION

Prefermentation tank: Gross volume - 5.000 l
Net volume - 4.000 l

(i) 2.900 l water with 30° C
(ii) slight aeration
(iii) 700 l of diluted molasses
(iv) transfer propagator
(v) nutrients: 1.7 kg DP, 1 kg AS, tp pH 4.5 sulfuric acid
(vi) fermentation is ready after about 12 hours when °Bg not decreasing anymore
(vii) temperature to be 30° C

MOTHER YEAST FERMENTATION

Main fermenter: Gross volume - 25.000 l
Net volume - 15.000 l

(i) 3.000 l of water with 30° C (234 cm)
(ii) Prefermenter (upto 350 cm)
(iii) Molasses 100 l
(iv) Turn on air at about 600 Nm^3/h
(v) follow the indicated ZULAUF

	Molasses	DP	UREA	AS	pH	Temp.
0	100	37			4,2	
1	-	20	10	20		30°C
2	100	20	10	20		
3	100	20	10	20		
4	100	20	10	20		
5	200		10	20		
6	200		10	20		
7	200		10	20		
8	200		10	20	4,4	
9*	300		20	20		
10	300		20	20		
11	350			40		
12	350			40		
13	350					
14	350				4,3	
15	-	-	-	-	-	
16**	SEPARATION					30°C

* open air to 1.200 Nm^3/h
** open air to 100 Nm^3/h

YEAST FERMENTATION

Main fermenter: gross volume - 25.000 l
net volume - 15.000 l

(i) 11.000 l of water with 30° C (322 cm)
(ii) 100 l of molasses
(iii) air at about 100 Nm^3/h
(iv) mother yeast, 90 kg diluted in 500 l water, Ph 2.0 - 2.2
(v) open air to 1.200 Nm^3/h and follow the indicated ZULAUF

	Molasses	DP	UREA	AS	pH	Temp.
0	100	25	3	-	3,8	32°C
1	200	20	10	17		
2	200	20	10	17		
3	200	20	10	17		
4	300	20	10	17		
5	300		10	17		
6	300		10	17	4,5	32°C
7	250		10	17		
8	250			17		
9	250			18		
10	250			17	4,8	
11	200					
12	200					
13	200					
14	-				5,5	32°C
15	SEPARATION					

ANNEX II

ANALYSES OF PROCESS WATER

Sample	Cl (mg/l)	pH	NO_2 (mg/l)	E-coli	Clostridium Wilchi	NH_4 (mg/l)	PO_4 (mg/l)	Org.Mat. (mg/l)	Fe (mg/l)	NaCl (mg/l)
1	0	6,8	0,96	20		4,0	0,27	6,8	2,3	0,6
2		7,2	0,96	20		4,0	0,54	4,8	0,7	0,6
3	0	6,8	0,64	20		3,0		1,8	2,1	0,5
4		6,8	0,96	20		3,0		1,9	4,3	0,5
5	0	7,0	0,60			4,0		2,3	0,7	0,6
6		7,2	0,64				0,54	1,7	0,6	0,4
7		7,2	0,94				0,54	2,2	0,4	0,4
8	0	7,4	0,64				0,54	0,8	0,6	0,8
9	0	7,0	0,60				0,54	0,5	2,2	0,6