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SUGAR CANE TRAINING AND DEVELOPMENT CENTRE

DP/EGY/81/010

EGYPT

Technical report: Cane sugar industry research and training *

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

Based on the work of H. J. Delavier, consultant
in Cane Sugar Industry Research and Training

United Nations Industrial Development Organization
Vienna

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V. 85 32581

CONTENTS

## Experimental (Cane) Sugar Plant

### Objectives:

The experimental cane sugar plant has the following objectives:

1. Training in Sugar Technolc gy

One of the objectives in training sugar industry staff is to give them knowledge and practical expeirnece in sugar factory prccesses. This Objective can be reach best in comparing various possibilities of sugar technologic operations on the same raw materials, e.g.

- to demonstrate the influence of foreign material raw juice on the composition of this purified raw juice in e.g. varying the pH-value during liming or liming plus sulfitation, etc.

  or

- to demonstrate the influence of various pH-values of limed raw juice or temperature at the same pH-value or content of invert sugar on the composition of characteristics of this purified juice

  or

- to demonstrate various retention times during raw juice purification on the composition or characteristics of this purified juice

  or

- to investigate one of the mentioned treatments of raw juice on the behavious of the juice during concentrating by evaporation or on the exhaustibility of sucrose from the low purity mother liquor, all experiments which cannot be carried out in an industrial sugar factory or plant without seriously disturbing the normal, pre-determined process, thus the economy of the factory, etc. In the experimental plant such trials and investigations are carried out quickly, under pre-determined and undisturbed, fully and closely controlled conditions, at low cost, without a risk for the industrial plant, reaching significant results. Furthermore, such results may be transferred into the industrial plants. These investigations can be repeated as often as needed until the process in total, together with the analytical evaluation of the result(s) is satisfactorily understood by the trainee(s).

2. Optimization Trials of Industrial Processes

Often the question arises whether a process in a sugar factory is carried out in the optimum way with the optimum result(s). It is difficult, due to the permanent changing conditions of the raw material reaching the sugar factory processes, to judge about the result of the operations.

It is easy to transfer this problem to an experimental plant where comparable raw material is made available and where in a rather short time the question can be answered: so it is well known that "numerical values" from different plants within a or from a certain process cannot be directly compared, but regarding the tendencies between these numerical values there, in most cases, exists a positive correlation, e.g. if a process fails in an experimental plant under very closely controlled operation conditions, it also will fail in the industrial plant, and the same tendency will exist in the case of a positive result; the detailed optimization of such process can be done easier in the industrial plant when the magnitude of order of the various parameters of influence on such process have been studied in the experimental plant. The objective interpretation of results of experimental plant trials may be easier and less doubtful due to the fact that the influence of "operational misundertandings" or such misinterpretation of operational conditions are widely if not totally excluded or avoided.

Time and operation costs are also of great influence in applying the activity of an experimental plant.

3. Development and Research

The development of the sugar industry (in total) and of sugar factory units (in detail) is a must in order to compensate for changing raw material conditions (e.g. sugarcane, agro-technical conditions, narvesting conditions), changing sugar quality demands, changing economic conditions, etc. e.g.: instead of producing a low quality "direct consumption" by classic juice purification processes, ecc. a higher sugar quality can be gained by applying surface active polymers for flocculation of non-sucrose substances, especially colourants.

The technical, technological and economical evaluation of such processes in an industrial plant is in most cases difficult (due to the reasons already mentioned in detail before), the result(s) can be doubtful, the management of the plant might be forced to come to a decision which can be completely wrong.

The investigation of such new processes, failing into the field of development and/or research, on the basis of the existing sugar factory raw material or intermediate products, is a valuable task of such experimental plant. By running such trials and carefully analysing of the product(s) it is possible to adjust such new process by modifying it, in contrary to the information given by the inventor or distributor, on the specific conditions of the given sugar factory, including an ecnomic assessment of the advantages for the specific sugar factory.

Besides that, till now little investigated problems of the cane sugar industry can be investigated and solved, e.g. the microbiologic problems, problems of water pollution and purification, the influence of certain aid material used in the sugar industry on the pollution, as formalin, and new aid materials can be easily evaluated by comparing with standard methods or processes.

Explanations of the positions to the "Principle Flow Diagram of Experimental (Cane) Sugar Plant", Kous 28/29 August 1985.

1 Raw juice receiving and storage tanks with screens, e.g. 200 mesh Tyler, for eliminating fine bagasse, etc.

2 Reaction vessels for e.g. "pre-liming" or "pre-sulfitation" or "phosphatation" of raw juice.

3 Suction fan system for eliminating evolving vapour from reaction vessels, e.g. $SO_2$-gas ($SO_2$-gas, wet, proof)

4 Reaction vessels for liming, sulfitation, phosphatation, carbonatation processes, etc.

5 Filter presses

6 Reaction vessels as 3

7 Filter presses as 5

8 Collecting tank for purified juice, to be pumped to 9

9 Thin juice storage tanks

10 Evaporation station

11 Juice - vapour separators (juice catchers)

12 Surface condensors with air pump for sucking-off non-condensed gases (vacuum pumps)

13 Syrup (or liquor) storage tanks

14 Evaporation-crystallizers "Vacuum pans", three different sizes

15 Cooling-crystallizers "crystallizers", two (or three) different sizes, with "water cooling jacket system" or heating system, together with water cooler (electric)

16 Centrifugal machines of different processing rates, e.g.:

No. 1: about 30 to 50 kg massecuite per charge, with water/steam sugar washing system, batch type

No. 2: about 8 to 10 kg massecuite per charge, as No. 1

No. 3: continuous type, vertical cone basket, acc. to availability

All machines with speed-variable drive.

## 4. The Experimental Cane Sugar Plant

The experimental cane sugar plant "pilot Plant" is laid out for a nominal cane processing rate of about 250 kg/h. This lay-out rate is not to be compared with the lay-out rate of an industrial plant: the processing rate of an experimental plant depends on the type of experiment which shall be carried out, e.g. in the case of the investigation of the retention time of the raw juice or an intermediate product of the e.g. amount of sucrose decomposition, colourant formation, which means that the "nominal lay-out processing rate" is not at all important. It is also to experience that it is about impossible or at least extremely difficult to manufacture small scale equipment in such a way that all parts of a plant are correctly related to each other in size or volume or mass flow rate, etc. It is, therefore, more clear to name such a plant "experimental plant" instead of "pilot plant" (which generally is an intermediate step in the development of an industrial scale plant from a laboratory scale plant).

The equipment designed is to carry out "functional model operations" of a sugar factory or of sugar technological character and the equipment, therefore, does not necessarily follow shape or design of industrial apparatusses and equipment or machinery; the experimental plant equipment design shall guarantee the realization of optimized operations excluding effects or influences of non-considered parameters so that the result(s) is (are) significant for the parameter under investigation only.

The experimental plant is not a "finally fixed" plant; whenever new problems arise, when newly invented equipment shall be investigated, etc. the experimental plant shall be extended or enlarged by this specifically needed equipment, in a certain size, capable to fit with the existing plant; the location of the experimental plant shall make possible the addition of such equipment, i.e. that sufficient space shall be left in the site of the experimental plant.

The operation of the experimental plant, its results, etc. can be sufficiently and correctly evaluated and utilized only when an adequate laboratory is attached or available to this experimental plant. This laboratory shall be more of a "research laboratory type" than of a "sugar factory routine laboratory type", and it should have, e.g. an automatic saccharimeter, an immersion refractometer, a spectrophotometer of the research type, chromatographic equipment also for gel-chromatography (investigation of colourants, etc.), a flame-spectrophotometer for inorganic non-sucrose components in raw material and intermediate as well as final products (especially those inorganic components which are of harzardous effect, i.e. Cu, et al), a Karl-Fischer-Titrator, besides the normal laboratory equipment needed for analyzing sugar factory products.

The laboratory facilities shall be made available in such a way that sophisticated equipment will be installed in correctly climatized, dust-proof rooms, etc. so that the equipment can be optimally used.

The laboratory personnel, running the experimental plant, acting as instructors, lecturers, etc., shall be well trained on this sophisticated equipment in order to guarantee a correct utilization/usage and a long life time of the aparatuses.

The experimental consists of:

1. Raw juice receiving and storage tanks, the raw juice shall be pumped from the Kous Sugar Factory milling station, and it shall be made possible that "mill juice" of different type can be processed in the experimental plant, e.g. "mixed juice", "first expressed juice", "first mill juice", "secondary juice", "last mill juice", etc., depending on the experiment or investigation. As well known, dispersed solid material in raw cane juice, i.e. fine bagasse or trashy material, influences the raw juice characteristics; the raw juice (or mill juice, etc.), therefore, shall be screened by means of a sieve in front of the raw juice tanks, and it is recommended a screen of 200 mesh Tyler (if the content of dispersed solid material after this screening is not negligable, a finer screen, e.g. 270 or 325 mesh Tyler, shall be applied); the screens shall be not fixed so that their cleaning can be done easily and microbiologic contamination of the plant from the raw juice is avoided; the juice from the sugar factory shall be investigated on microbiologic contamination, and a satisfactory disinfection shall be carried out, if needed. The raw juice to be processed in the plant shall be steril, if not a specific experiment regarding non-sterility, etc. shall be carried out. The tanks are monted on a stand.

2. Reaction vessels for liming or "pre-liming" etc., two reaction vessels are available, with electric stirrers, to be heated, for determining the volume of juice going into the process, the operating volume of all reaction vessels is about 20 $dm^3$, and for "pre-treating" processes, as "pre-liming", "pre-sulfitating", etc. These vessels are filled by gravity from the storage tanks, and the juice flows by gravity to the next reaction vessels. Developing vapour or gases of $SO_2$ are sucked off by a ventilation system 4; the vessel shall be, among others, equipped with a pH-electrode, connected with a pH-meter and recorder.

3. Reaction vessels for liming, sulfitation, etc.; four reaction vessels are planned, with electric stirrers, with heating device, in which the main steps of the raw juice purification shall be carried out. In order to be able to follow the reaction, each vessel, among others, shall be equipped with a pH-electrode, connected with the pH-meter and recroder, as 2. The connections with the vessels 2 are to be done in such a way that all vessels 3 can be run in parallel or in sequence; juice from the filters can be recycled (e.g. for nucleation, etc.); the treated juice is pumped to the filter presses 5 or passed to the vessels 6, etc. The operation shall be discontinuous, but continuous operation can be done when balancing the system regarding flow velocity, depending on the type of experiment. Developing vapour or gases are sucked off by the ventilation

system 4. The lime, phosphate, etc. are to be supplied from the laboratory or the sugar factory, the gases $CO_2$ or $SO_2$ shall be supplied from cylinders be means through a reduction valve so that sufficient pressure is applied to introduce the gas into the juice column.

4. Suction fan system, etc. in order to exhaust escaping gases, especially $SO_2$, the vapour and gases respectively from the heads of the reaction vessels must be sucked off by a corrosion resistent suction fan system and blown off above the roof; the material shall be a sufficiently resistent plastic material, as the temperature of the vapour is between room temperature and about 100 $C^o$ at the head of the vessels, within the system below 100 $C^o$.

5. Filterpresses, in order to separate precipitated non-sucrose material from the purified juice, filter presses (pressure filters) have been found to be most suitable, especially when, if needed, filter aid, as kieselguhr, etc. is added to the turbid juice. In order to evaluate juice characteristics after the purification process, it is necessary to completely eliminate precipitates from the juice, if "turbidity" shall be the parameter under investigation, the wanted degree of turbidity of the to be treated juice can be reached by addition of a predetermined amount of precipitate to the filtered juice (filtrate) so that also such an investigation is under close control; a water connection allows to desweet the filtercake.

6. Reaction vessels as 3, in order to allow a wide variation of raw juice purification processes, a second group of two reaction vessels is planned, layed out in the same manner as those of 3, e.g. a second carbonatation process in the liming, carbonatation process, or a second sulfitation process in the liming-sulfitation process, etc.

7. Filterpresses as 5; in order to separate the precipitate of the second carbonatation or sulfitation, etc. processes, or to refilter the filtrate of the first filtration process, a second group of filterpresses are planned, layed out as those in 5.

8. Collecting tank for purified juice, the purified juice is collected in a tank before it is pumped to the storage tanks for thin juice in front of the evaporation station.

9. Thin juice storage tanks, in order to guarantee a continuous supply of thin juice to the evaporators, three thin juice storage tanks are planned, in these tanks the thin juice sall be heated up to 100 $C^o$ before being fed to the first evaporation effect.

10. Evaporation station; the evaporation station is planned as a quadruple effect evaporation system, with the same heating surface in each effect. The evaporator bodies are switched in such a way that the usage of the plant is rather flexible. The condensates of the effects shall be collected separately.

11. Juice vapour separators, sucrose solution drops from the juice in the evaporation station going with the vapour of the last effect or from the evap-crystallizers are to be separated by means of "juice catchers" equipped with traps so that the predetermined pressure (vacuum) in the vapour system is not disturbed when the juice - vapour separator must be emptied.

12. Surface condensors, two surface condensors are planned: one for the evaporation station and one for the evapo-crystallization station; the separation of the two systems from one another is recommended due to practical reasons: the batchwise operation of the crystallization apparatuses cannot disturbe the continuous operation of the evaporation process. The condensate of the two condensors shall be collected in a special tank to be used as warm/hot water in the plant. Non-condensed gases are to be sucked off by water-ring air (vacuum) pumps.

13. Syrup storage tanks; the concentrated juice, the thick juice or syrup is collected in three tanks before the syrup is used in the crystallization apparatuses. These tanks also can be used for the preparation of liquor if such investigations or experiments shall be done, the tanks are equipped with electric stirrer and heating device.

14. Evaporation-crystallizers; for the crystallization of sucrose from syrup or from liquor or from run-offs or molasses, etc. three "vacuum pans" are planned, each of different size from the others, the difference in working volume is laid out in order to have apparatuses for varying masses or volumes of sucrose solution to be processed. Depending on the working volume the apparatuses are equipped with coil or tube-calandria. It is recommended to apply a mechanical/electrical stirrer in each crystallizer. The massecuite is discharged through bottom valves. The type of automatic instruments to be applied shall be discussed, as depending on the working volume the amount of instruments appliable is limited.

15. Cooling-crystallizers, the massecuite from the evapo-crystallizers is dropped into the cooling-crystallizers, which are of different working volume, in order to be directly centrifugalled or to be cooled for mother liquor exhaustion, the cooling-crystallizers are equipped with water-jackets, the cooling water shall be cooled by an electric cooler in order to be able to reach temperature values below those of the surrounding, the massecuite is discharged from the crystallizers through bottom valves, the cooling crystallizers shall be made movable on rolls, the rotational speed of the stirring device of the crystallizers shall be variable.

16. Centrifuges, two batchwide operating centrifuges shall be applied, one of a rather great size, 30 to 50 kg massecuite per charge, which shall be used for separating big amounts of massecuite, the second of a size of 8 to 10 kg massecuite per charge so that e.g. affination trials can be carried out.

    A continuously operating centrifuge, with vertical cone basket of a predetermined angle, with variable electric drive, is recommended the realization depends on the availability of such machine.

5. General

The diagram does not contain any valve, it does not show any instrument, it does show the flow lines in general and principle, in the case of the realization of this plant proposal, more detailed diagrams must be drawn. The size of the apparatuses can be estimated by the scale 1:50, but these estimates must be confirmed/corrected in the respective exact and final manufacturing blue-prints.

Tanks for warm/hot water, cold water and the respective pumps are not included in the diagram.

The steam supplied by the Kous Sugar Factory shall be of the wanted characteristics; it is recommended to have the reducing and desuper-heating stations for such steam in the experimental plant room. The equipment mentioned shall be mounted in steel frames of specific lay-out, height, with walk-ways behind and in front of the equipment for safe working and servicing.

The electric energy supplied shall be of sufficient constancy regarding tension (V) and frequency (Hz) so that damages on the equipment are avoided.

It is recommended to combine the respective groups of functional equipment in units in order to improve the operation and managing of the plant.

Location of the Experimental Plant

The experimental plant shall be connected with the Kous Sugar Factory for supplying the experimental plant with raw juice, steam, electric energy, etc. in order to avoid the respective equipment: steam boiler, diesel generator set, sugarcane extraction plant in the experimental plant. This means that the experimental plant can be operated only during the cane processing season of the Kous Sugar Factory from about beginning of December to the end of April, if experimental work shall be done during the off-crushing season of the factory (the maintenance phase of the factory), a source for steam will be provided and the respective raw material. This means that the experimental plant can be used through all the year.

In order to secure an easy supply of the mentioned items to the experimental plant, it shall be located rather close to the sugar factory; the former sugarcane reception plant plus laboratory building is a satisfying location after removing the existing laboratory mill plant (to be maintained and stored safely) and rehabilitate the buidling; the needed space for the

different laboratories (as explained before) can be made available; the building shall be isolated in such a way that dust, etc. from the sugar factory and its operations cannot enter the experimental plant.

Manufacturer of Experimental Plant Equipment

The experimental plant for the Indonesian Sugar Research Institute at Pasuruan, East-Java, in 1972/73, was supplied by the company:

Bernhard Utzschneider
Apparatebau-Kupferschmiede
D-1000 Berlin-Tempelhof 42
Germany

in manufacturing the apparatuses and adding the equipment which was manufactured by other specialized companies, as pumps, electric drives, electric equipment, water-ring air (vacuum) pumps, armatures, control equipment, etc. The Indonesian plant was pre-installed in Germany in the sheel stands, in groups (as mentioned before), packed and shipped, at site unpacked, put at the point, connected with steam, electricity, water, etc. and started. The Company Bernhard Utzschneider, consequently, owns the blue-prints of the Indonesian experimental cane sugar plant. In case Société manufactures the plant in her workshops, new blue-prints must be prepared.

Sugar Industry Information Centre

The stage of development of an industry, here the sugar industry, will depend, among others, on the stage of the development of the knowledge and experience of staff and workers of this industry. The possibilities of improving this level are aminly by training/edcuating courses and by self-study. Bases of these two possibilities are experiences and knowledge gained from the person's own work and the processing of the information received, but to a great part, if not to a greater one, it depends on the utilization of literature information. Literature information are available mainly in two forms: one is the form of a book (textbook, handbook, etc.) the other is the form of a periodical (magazine, proceeding, annual report, technical/technological, etc. leaflet, etc.). The more important form of literature from the two is that of periodicals, the so-called "running literature" (whereas book literature can be termed "static literature", which informs on the most recent developments, experiences, change in knowledge and philosophy, etc. in a certain field; this type, therefore, is the most suited to bring up the level of the staff of an industry, to keep their level of knowledge on the "world mean level" and so up to date. This "up to date level of knowledge" can be achieved only by a systematic and permanent study of such "running literature", which means that this type of literature must be made availalbe to the respective staff.

The Training and Development (Research) Centre for the Sugar Industry at Kous Sugar Factory must get an "up to date library" for the training in sugar technology, this installation of a library needs the supply of such running literature (otherwise the level of knowledge of the trainers and trainees will be not up to date) which can be used for an Egyptian Sugar Industry Information System, a few experienced specialized librarians

(e.g. for the first retired chief chemists with a special training in librarian-work or chief engineers, etc.) process the incoming running literature, select publications of special interest for the Egyptian Sugar Industry, translate them into Arabic, abstract (as many as possible less interesting publications, and publish these translations and Arabic abstracts in form of a, say, two-monthly "Information Letter" which is spread in all Société sugar factories. In order to check of the utilization of such Information Letter, an annual two or three-days "progress meeting" of all respective staff of the sugar factories shall be organized, in which meeting Progress Reports on preselected topics shall be given; furthermore, the Central Board of the Société shall select for each year a brand-interesting topic of the Egyptian sugar industry, the topic to be handled as an assignment for investigation; the systematic study of this topic from the literature together with the processed results from all (respective) sugar factories involved shall give a possibility to solve the respective problem in a mutual effective way. Such "General Research and Development Topic" can be given to the Training Centre in order to let it do the organizationla work as well as the backgroun feeding and investigation guiding works. In this aspect it is also recommended to concentrate all main research and development and training activities of the Société des Sucreries et de Distillerie d'egypte in one Centre in order to make the optimum use out of it and to keep a high degree of consistency in such activities.

Regarding the librarians in the Information Centre, it cannot be expected that all important literature is published in e.g. English only it is, therefore, necessary that these librarians have a good knowledge of German, Spanish, French and Portuguese too, but most of the important literature in sugar industry is published in English.

The following periodicals shall be available within the Information Centre:

Sugar Industry Abstracts (ir English) by Tate and Lyle Co. Ltd.

Sugar Tecnnology Reviews (in English) by Elsevier, Amsterdam irregularly published, from No. 1, Vol. 1 on

Zuckerindustrie (in German, but with English articles; mainly cane sugar industry regarding publications in English, English, French and Spanish abstracts or summaries)

International Sugar Journal (in English), Louisiana, USA

CubaAzúcar (in Spanish), Cuban Sugar Ministry, Cuba

Taiwan Sugar (in English), Taiwan Sugar Corporation, Taipeh, Taiwan

Proceedings of American Society of Sugar Cane Technologists (American SSCT), Louisina and Florida Section (in English)

Proceedings of the Australian SSCT (in English), Australia

Proceedings of the South African Sugar Technologists' Association (in English), Durban/Mt. Edgecombe, South Africa

Proceedings of the Japan Society of Sugar Ref. Technologists' (in Japan, but with extensive English summaries, all numerical values,

units, descriptions of figures and tables in English)

Proceedings of ICUMSA (in English), 4 annual

Proceedings of the International SSCT, 3 annual (in English)

Annual report of Hawaiian Sugarcane Planters' Association (in English)

Annual report of Taiwan Sugar Research Institute (in English)

Annual report of Sugar Milling Research Institute (in English), Mt. Edgecombe, South Africa

Annual report of Mackay Sugar Institute (in English), Mackay, Australia

It is rather difficult, but not impossible, to write for the publications to the respective institutions in order to directly subscribe for the publications (the correct addresses will be provided by the undersigned).

There exists one editing company in the world which is specialized on sugar industry:

Verlag Dr. Albert Bartens
Luckhoffstrasse 16
D-1000 Berlin 38, Germany

which has relations in order to provide most of the sugar lieterature published in the world, it is possible to subscribe for the named literature at this editing company in order to ease the purchasing of this well needed literature. The undersigned gets the literature for his course in the University of Khartoum also through this editing company, with great success.

ANNEX I

**MINUTES**

Meeting Saturday 24 August 1985

Société des Sucreries et de Distillerie d'egypte. Office 11 hours

Present:

Mr. Mohamed Abdel Khalek El Sawah
Director General of Production

Mr. Abdel Azim Bedewy

Dr. Ghander
General Director of Medical Center at Kous Sugar Complex

Project: Cane Sugar Industry Research and Training Center at Kous
DP/EGY/81/010/11-51/31.7.C

The consultant was informed that the assessment of the project regarding the content of training programmes, research equipment needed, literature in form of books needed had been done already by the UNDP Expert Mr. Zwaardemaker who has prepared a thorough report about his findings and recommendations. A copy of the report was handed to the consultant.

The consultant based his understanding of the project on the letter of Mr. El Sawah of 5 November 1983 in which four priorities are mentioned:

Priority 1: Xerox copiers
Priority 2: Books
Priotity 3: Film projector, 16 mm
Priotity 4: Eductive video films or cinema, 16 mm on various technical and technological topics, equipment in form of models, to show the details of the equipment fron inside.

and consultant was informed that the equipment of Priority 1 and 3 (one piece of equipment instead of the wanted two pieces) has been supplied.

Consultant made clear that the wanted models of Priority 4 are not available in the market, but that they can be manufactuered on special request and design, which will be entremely expensive.

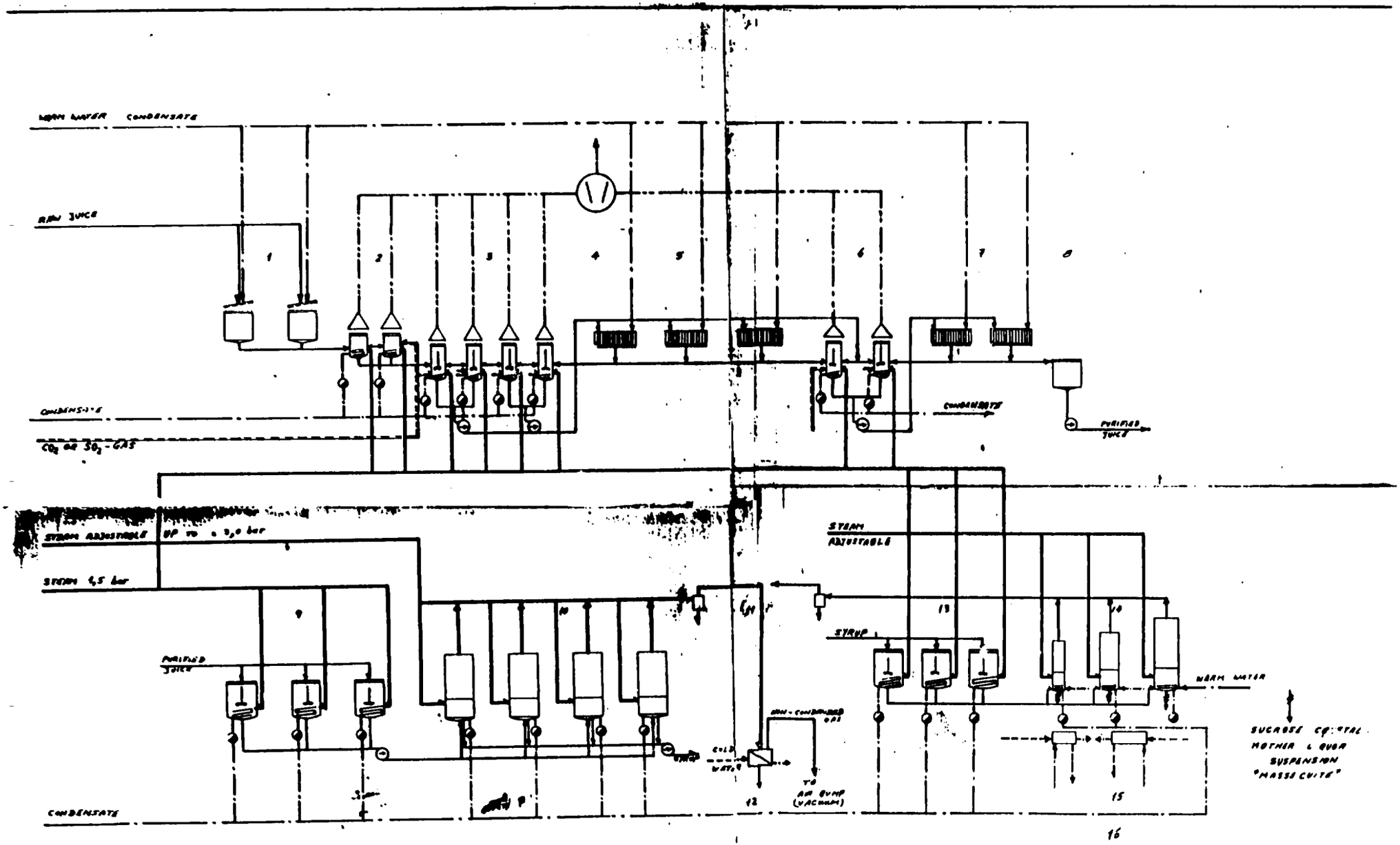
Mr. El Sawah, then, explained that these models are not more interesting because the Société des Sucreries et de Distillerie d'egypte Training Centre at Kous will use the industrial equipment for demonstration, when needed, but that the main problem left is that of the installation of an Experimental Plant (Pilot Plant) at Kous, as already discussed with UNDP.

The consultant explained that an experimental plant is not a "Model Plant" which exactly demonstrates industrially applied types of machinery or apparatusses but that it is a "Functional Model" which allows, as much as possible and as accurate and controlled as possible, to simulate processes and steps of processes in sugar factories and that such a plant allows the repetition of such experiments using the same raw material which allows to compare the experiment results in a scientific way, e.g. by statistical analysis (which a sugar factory does allow only under certain conditions and in certain experiments because the raw material of the sugar factory changes and varies from every minute).

The consultant made clear that he has no "blue prints" of an "experimental plant" because the plant in Indonesia (at BP3G Pasuruan) was manufactured by a Berlin manufacturer under the technical and sugar technological supervision of the consultant, and this company possesses the blue prints.

The consultant, who is of the opinion that an experimental plant is of very high value for a sugar industry for training purposes and for experimental/development work, declared himself ready to draft a technological sketch of an experimental plant which will be qualified for the tasks the Training and Development Center at Kous shall fulfil. The details of such a plant cannot be fixed within the contracted time of consultancy, as this time is too short. A solution shall be found in order to get the Société the needed detail information in order to prepare the design drawings and to manufacture or provide the needed parts of the experimental plant.

Prof. Dr. H. J. Delavier
Cairo, 26 August 1985




PRINCIPLE FLOW DIAGRAM OF
EXPERIMENTAL (CANE) SUGAR PLANT
SCALE about 1:50
Kous 28/29 August 1955
DR. DELTVIER

ANNEX II

**MINUTES**

about the Meeting Saturday, August 31, 1985, 11,15 h at the Office of Société des Sucreries et de Distillerie d'Egypte (So.Su.Di.E.)

Project: DP/EGY/81/010/11-51/31.7.C

Present: Mr. Mohd. Abdel Khalek El Sawah
Director General of Production

Mr. Abdel Azim Bedewy
Assistant to Mr. El Sawah

Consultant

Société des Sucreries et de Distillerie d'Egypte accepts the proposals of the Consultant regarding the Experimental Plant and is going to contact the manufacturer in Berlin, Mssrs. Utzschneider, in order to get a proforma invoice about the complete plant and another one about the workshop drawings. So.Su.Di.E. also will contact Verlag Dr.Albert Bartens in Berlin for getting more informations about the recommended literature.

Consultant was ready to prepare all necessary detail informations for Mssrs. Utzschneider for elaborating the proforma invoices and to give a copy to So.Su.Di.E., and So.Su.Di.E. will send copies to Consultant about this correspondance so that there is guaranteed a mutual exchange and information about this matter.

In case found necessary by UNDP Cairo - Consultant strongly recommends to find necessary - another meeting shall take plave at the Office of So.Su.Di.E. before the departure of the Consultant.

The discussion went on about the Training Courses in Sugar Technology at Kous Training Center; the lecturers/trainers in the Courses are factory officials of sufficient experience and of respective basic knowledge and invited specialists according to the necessary. The distribution of the courses are given in the attached diagram; the number of participants - up to the 5th Course, starting in 1986 - for the time being is 30, the Course covers two years, the degree of efficiency regarding the number of finalizers on the number of beginners was 50 %, and it has increased to 75 to 80 %.

Cairo, August 31,1985

Prof.Dr.Hans Joachim Delavier

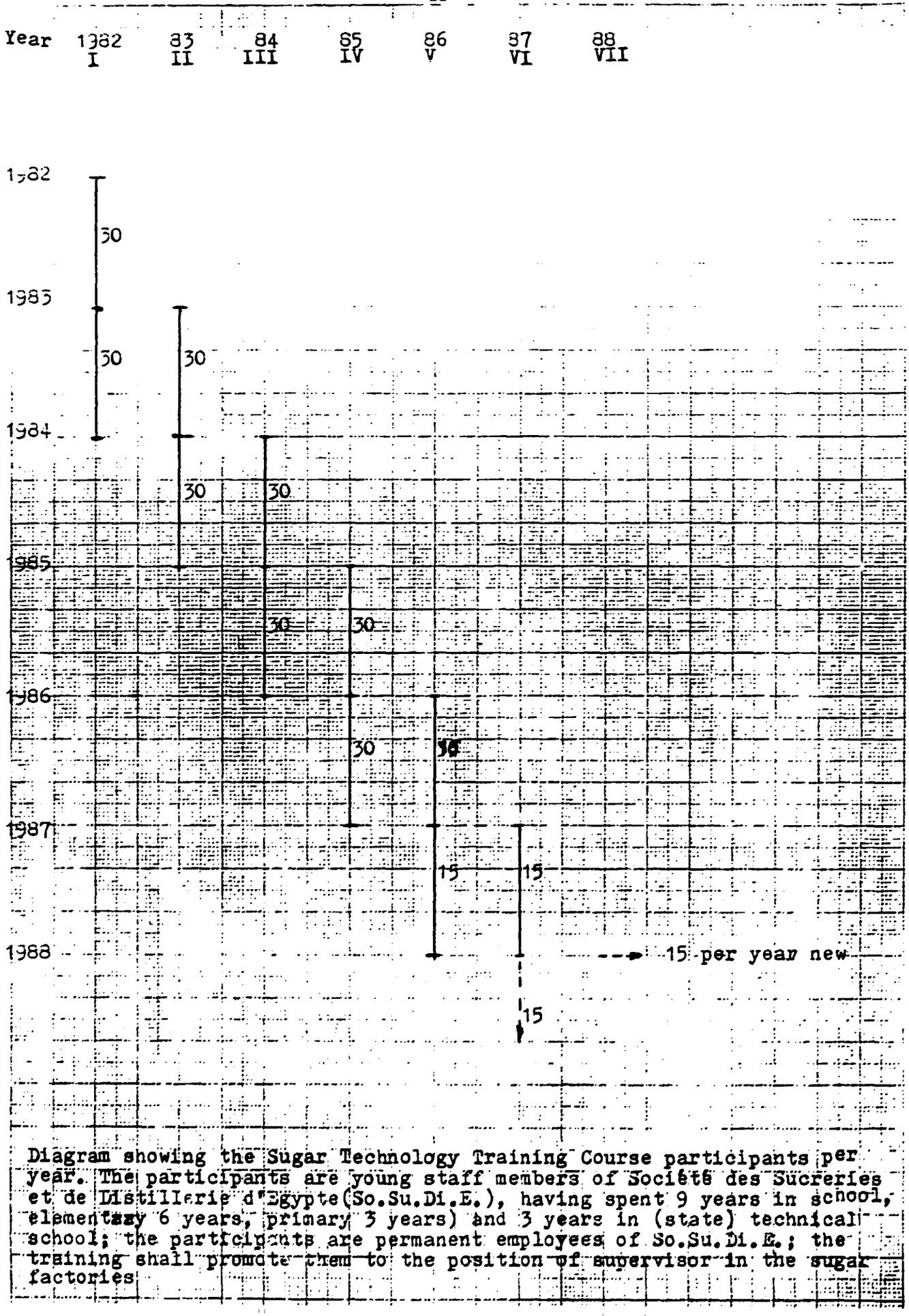



Diagram showing the Sugar Technology Training Course participants per year. The participants are young staff members of Société des Sucreries et de Distillerie d'Egypte (So.Su.Di.E.), having spent 9 years in school, elementary 6 years, primary 3 years) and 3 years in (state) technical school; the participants are permanent employees of So.Su.Di.E.; the training shall promote them to the position of supervisor in the sugar factories

ANNEX III

# REPORT

Professor Dr. Hans Joachim Delavier, University of Khartoum,
Khartoum, Sudan

Project: DP/EGY/81/010/11-51/31.7.C
Post Title: Consultant in Cane Sugar Industry Research and Training
Duty Station: Cairo and Kous
Duration: 21 August to 3 September 1985

Programme of the Mission:

| | | |
|---|---|---|
| 21 August 1985 | 23:00 | Off residence Khartoum for airport Khartoum |
| 22 August 1985 | 04:30 | Flight MS 754 Khartoum/Cairo |
| | 11:30 | Arrival Cairo delayed due to weather conditions in Cairo |
| | 13:00 | Briefing at UNDP office about project by UNDP Mr. Tharwat Sabry |
| 23 August 1985 | | UNDP office study of project be means of UNDP files |
| 24 August 1985 | 11:00 | Meeting at Société des Sucreries et de Distillerie d'egypte office, Cairo:<br>Mr. Mohamed Abdel Khalek El Sawah<br>Director General of Production<br>Mr. Abdel Azim Bedewy<br>Assistant to Mr. Sawah<br>Dr. Ghander<br>General Director of Medical Centre of Kous Sugar Factory |
| 25 August 1985 | | Preparation of Information for project |
| 26 August 1985 | | Preparation of project ideas |
| 27 August 1985 | | Meeting at UNDP office with the UNDP Deputy Resident Representative, Mr. Frank Hartvelt<br>Preparation for study visit at Kous Training Centre |
| 28 August 1985 | 03:30 | Off hotel for flight to Luxor: together |
| | 06:30 | Arrival at Luxor with Mr. Bedewy |
| | 07:30 | Arrival at Kous Sugar Factory |
| | 08:30 | Meeting with the General Director of Kous Sugar Factory, Mr. Yehia Selem El Shereif, and Kous Staff members |

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| | | Visit of site for Training Centre and for Experimental Plant |
| | | Discussion on project |
| 29 August 1985 | | Discussion on project, preparation of principle flow diagram of the Experimental Plant |
| 30 August 1985 | | Continuation of the work on flow diagram, preparation of legende, explanation of the diagram, reporting, finalizing of diagram |
| | | Discussion of draft of reports with Mr. Bedewy and Mr. El Shereif |
| | 23:30 | Flight to Cairo |
| 31 August 1985 | 11:15 | Meeting at Société office about draft of recommendations of consultant on Experimental Plant at Kous sugar factory for Training and Development Centre |
| | | Drafting of detail letter to Messrs. Utzschneider Berlin, Germany |
| 1 September 1985 | | Meeting with Mr. T. Sabry, UNDP, about project |
| 2 September 1985 | | Meeting with Société at Société's office for finalizing consultant's proposal and to fix the next steps in the project promotion |
| 3 September 1985 | | Meeting with Mr. Sabry, UNDP for finalizing the Consultant's report |
| 4 September 1985 | 00:01 | Departure of MS753 from Cairo to Khartoum |

Prof. Dr. Hans Joachim Delavier
Cairo, 3 September 1985

Statement about the Duties Account to the Job Description

Duties: The consultant, in close co-operation with the National Project Director and the staff of the Centre. Will be expected to:

1. Make an assessment of the existing training facilities and programmes for specific skills required in industry.
2. Advise on the Centre's activities in respect to the applied research and training of national staff in various fields of specialization.
3. Advise on the laboratory and pilot plant equipment for research activities and on audio-visual training aids and materials.
4. Advise on the organization of a study tour programme.

Statement:

ad 1. From the briefing at UNDP and from the meetings with Société it became clear that the main point of interest within the mission in item 3, as the training programme of the sugar technology courses was already evaluated by the UNDP expert. During his stay at Kous Sugar Factory, Consultant studied the existing training location; the building for the vocational training has grown to the point where the roof construction will start; the building itself is in the stage of the "raw construction"; it is expected to be ready for training by January/February 1986 (which seems to be reaslistic); the building for the sugar technology training is sufficient for about 15 course participants, but for the time being, due to the need of training staff for the new sugar factory Girga, each course, for two years, starts with 30 participants (see diagram).

Consultant strongly has recommended to add a laboratory within this Training Center in order to carry out the basic practicals in this laboratory (avoiding the disturbance of the routine process control in the factory laboratory and the disturbance in the experimental plant laboratory, especially when research work is being done here.

ad 2. As to be seen from the report, consultant has recommended to add to the Kous Training Centre an Information Centre for the Egyptian Sugar Industry in order to train national staff, i.e. staff of the Egyptian Sugar Industry, generally by spreading information from other sugar industries. Within his report, the consultant gave some hints for applied research/development work to be carried out, and some ideas were given by the UNDP expert Mr. Zwaardemaker. The Egyptian Sugar Industry should develop research programme including important topics, as recommended by the consultant. The Société will ask for a training methodologist from abroad in order to let check and possibly improve the training activity at the Kous Centre.

ad 3. Audio-visual training material is not available in the market as such, but there are films and diapositive series, especially from manufacturers of equipment and material for the sugar industry, BMA has a 16 mm film about the VARIANT centrifuge mainly in the form of animation, which should be collected and the important parts used as audio-visual material, or such audio-visual material must be prepared by the Training Staff.

Models of sugar factory equipment and machinery, which show any detail, for demonstration, are not available in the market, such models must be manufactured on special design drawings, the purchasing of such models will be extremely expensive. Société understood that the demonstration on sugar factory equipment can be made much simpler, but much more effective on sugar factory equipment in the factories (or on older equipment, out of usage, which can be installed in the Training Centre).

The "Pilot Plant" for experiments and training (by experimenting) better called "Experimental Plant", was drafted in form of a basic flow sheet so that further activities can be started, e.g. in finding a clear basis for the financing of the plant (see special reports).

ad 4. The study tour was no item of the discussion as the financing of this tour shall be discussed when the price for the Experimental Plant is available.

Prof. Dr. Delavier
Cairo, 3 September 1985