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PREPARATORY ASSISTANCE ON THE ESTABLISHMENT OF A PACKAGING CENTRE

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SAUDI ARABIA

Technical report: Studies, consultancy and recommendations on technical and financial aspects for the establishment of a packaging centre at the Saudi Arabian Standards Organization*

Prepared for the Government of the Kingdom of Saudi Arabia
by the United Nations Industrial Development Organization

Based on the work of Abdelhaq Bennouna, consultant in packaging research and quality control institutions

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* This document has not been edited.

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1.0 SUMMARY AND CONCLUSIONS

The economic growth of the Kingdom of Saudi Arabia is actually based on the expansion and diversification of the country's production as well as on outmost improvement of its natural resources in both industrial and agricultural sectors. The local exchange acceleration on this market, which has known the introduction of a modern consumption model together with its freedom based on a vivid competition have closely contributed to a packaging industry take off; an industry that constitutes at present a decisive factor in the industrial development and in the trade strategy.

Packaging has been hindered by several problems that contributed a lot in braking down its evolution, such problems are:

- Shortage and instability of technical manpower and expertise that would improve understanding technology and production processes.

- Semi-absence of scientific and technical research based infrastructure to stimulate the growth of packaging industry and quality control.

- Insufficient concern for import substitution and gradual use of locally available materials.

- Relative absence of a specialized laboratory that would be able to ensure the consumer's protection in matters of food health through the products and packages compatibility.

Studies directed within the framework of ARPAC Project, underlined the principal obstacle that constitutes a hindrance for packaging industries development in the Kingdom. The studies recommended the creation of a packaging centre at the Saudi Arabian Standards Organization (SASO).

In complete recognition of the important role played by standardization in furnishing the technical infrastructure so essential for successful industrial development, the government set up, by the royal decree, the Saudi Arabian Standards Organization (SASO). SASO is the only Saudi Organization, according to the provisions of the Royal Decree, responsible for all activities related to standards and measurements to provide industry and other sectors with the much needed documentary standards to guide their activities towards greater efficiency, productivity quality and to protect the consumer.

SASO will extended its activities to the field of packaging by the establishment of a specialized centre based on advanced laboratory facilities at a qualified staff to promote a technical assistance to the national industry in the Kingdom and the other GCC Countries in the following areas:

a) Establishment of technical specifications of the packaging materials and packages on the paper board, metal, glass, plastics and laminates, food compatibility and transport packaging systems.

b) Graphic design.
c) Documentation/Information System.
d) Training Programmes.
e) Research/Development.
f) Packaging Standardization.

Being a public institution that aims at supporting the industries and all national sectors of economic and social activities, the consequent beneficiaries of the project will be the packaging materials manufacturer industries, who will dispose of locally available upto level advice on the types and specifications of the materials to be produced, as well as the packaging industries who will have available similar advice on the packaging materials and packages which might be used for specific products, markets and distributing systems. In addition, the results of the project could be utilized by member states of the Gulf Cooperation Council (GCC).

2.0 INTRODUCTION.

2.1 BACKGROUND.

The Kingdom of Saudi Arabia experiences an extraordinary development process based on the country's productive structure diversification and expansion by turning to non-oil sectors, especially industrial and agricultural ones:

The industrial sector, which recorded a growth rate of over 14% in the 3rd plan (1980-1984), comprises a large entreprise network. 2.850 units in May 1988. Its production is essentially oriented to the domestic market. This latter, distinguished by its open tendency and its sharp competition, is influenced by an agressive marketing action where packaging plays a prevailing role.

Despite the progress it achieved in different respects, packaging materials industries has still a long way head before it would be able to meet the national growing needs. Its development has not kept up with that witnessed in the other industrial sectors.

On the other hand, public authorities have taken up several measures that aim ot encouraging and motivating the economic field in general and the industrial sector in particular.

Standardization has been given a particular attention. This interest was evidenced in 1972 by setting up an autonomous institution and endowed it with adequate means that would help it bring into action such a policy. As a matter of fact a royal decree gave birth to the Saudi Arabian Standards Organization (SASO).

SASO has, since then, developped its manpower resources, reaching a total staff of more than 450 people working in technical and administrative fields. Adding to this a set of specialized laboratories that have adopted and brought into practice over 600 national compulsory standards that cover the Country's whole social/economic sectors.

Nevertheless, only about ten standards have been adopted in the field of packaging. This is due to a lack of national expertise in this respect as well as the absence of specific and qualified laboratories.

The specific purpose of the present mission has been to carry out a study on the technical and economic conditions, for the establishment of a packaging center within the framework of SASO. Such center would mainly concentrate its action on the provision of the necessary technical assistance to industry in the field of staff training, quality control of packaging materials and package specifications, technology transfer together with design and marketing.

The center will equally establish close relationship with the concerned entities, research/development programmes will be conducted by the center in order to ensure a maximum care of the locally produced raw materials, particularly plastic ones, in the packaging industries. It may extend its services to other Arab Countries chiefly those of the GCC.

2.2 JOB DESCRIPTION

(See attached ANNEX I).

3.0 DESCRIPTION OF THE WORK CARRIED OUT AND RESULTS.

3.1 Analysis and discussion of the terminal report of ARPAC Project.

Despite its premature end, ARRAC Project (1984-1986), successfully rendered several services and achieved various actions in favour of the arab countries in the following fields:

a) Industrial and other related sector staff training (over 250) through the organization of 8 seminars, specialized training courses and fellowships.

b) Study of the Arab packaging industry conditions as well as their needs and investment potentials in the field of identified complementarities. This study, which has lately been finalized, represents both a basis and an acquisition for all the Arab Countries. It should be largely spread for better results.

c) Technical assistance to public authorities and industries by means of field missions. Twenty high ranked experts carried out missions in different Arab Countries, including Algeria, Tunisia, Lybia, Jordan, Iraq, Saudi Arabia, South yemen and Sudan. These missions aimed at identifying the Countries requirements and the formulation of recommendations in this respect.

d) The establishment of a local joint network that comprises packaging national committees and qualified institutions.

e) A study of the establishment of a documentation/ information centre to be in connection with the Arab industrial development organization (AIDO) and the publication of a periodical.

f) Assistance for the setting-up of specialized laboratories and/or packaging Centers/Institutes in Arab Countries like Saudi Arabia, Algeria, Tunisia, Jordan, Iraq.

Various other important activities have not been achieved, in particular:

- Preparation of a technical guideline for the establishment of the packaging Arab Standards and the eventual introduction of a quality control certification system for application at the national and regional levels.

- A packaging thesaurus.

- A packaging trilingual dictionary into English, French and Arabic.

- Audio Visual Training Courses.

- Regional technical assistance for all the arab countries mainly in the fields as follows:

  i) Creation of national centers and/or specialized laboratories.

  ii) Improvement of the industries quality and quantity production either for the producers or the users.

  iii) On site domestic training of technicians by qualified experts.

  iv) Trainers training programmes taking into account existing human and materials resources in some Arab Countries such as Morocco, Egypt, Saudi Arabia etc...

  v) Study and promotion of common project in the field of packaging material production in the light of the conclusions and recommendations set by the above mentioned global study.

- A study on the environment protection in liaison with packaging material recycling.

- Technical assistance to the less developed Countries.

As per ARPAC Project recommendations with regard to technical assistance to the Kingdom of Saudi Arabia in this field:

SASO

(i) Consultancy missions for the establishment of a packaging centre 3 m/m.

(ii) Establishment of transport worthiness testing laboratory.

(iii) Fellowship Training of three technicians on packaging testing.

(iv) Seminar on packaging standardization.

3.2 Analysis of the aims, structure and functionning of the Saudi Arabian Standards Organization (SASO).

Since the beginning, the Kingdom's government, put into force a set of rules and regulations as well as institutions that would help keep pace with the industrial development, allow intersectional integrity and ensure its extension on scientific and technical basis, particularly a set of national standards inspired from international ones on the one hand, and adapted to the Kingdom's environment and specific conditions on the other hand.

a) SASO is the only Saudi Organization, according to the rules of the Royal Decree M/10 dated 1392(H)3.3, responsible for all the activities related to standards and measurements including:

- The formulation and adoption of national standards for all commodities and products as well as metrology symbols, definitions of commodities and products, methods of sampling and testing and any other assignment approved by the Board of Directors.

- Publication of standards by the most suitable means.

- Diffusion of standardization awareness and the coordination of activities relating to standards and measurements in the Kingdom.

- Setting the rules that regulate granting certificates of conformity and quality marks as well as their issuance and use.

- Participating in the regional and international standards organizations, exchanging views, assisting in cooperative efforts and representing the Kingdom in conferences and meetings of standards Organizations.

b) The administrative structure is made up of the following departments:

1. Standards General Department.
2. Quality Control General Department.
3. Laboratories General Department.
4. Administrative and Financial Affairs General Dept.
5. Planning and Development Department.
6. Legal Affairs Department.
7. Public Relations Department.
8. Information Centre.
9. Makkah Zone Office.
10. Eastern Zone Office.

Each of these departments is divided into specialized sections serving the needs of their specific assignments.

The Saudi Arabian Standards Organization participates and represents the Kingdom in the following International Organizations:

- Standards and Metrology Organizations for GCC Countries.
- Arab Organization for Standardization and Metrology (ASMO).
- International Organization for Standardization (ISO).
- International Electro-Technical Commission (IEC).
- Codex Alumentarius Commission (CAC).

The Organization also participates in the activities of a total of 85 of ISO Committees.

c) SASO has now a technical and administration staff capacity of 450 persons. It has since its creation undertaken various standardization works in packaging fields, in particular in ASMO committees. However its activity in this respect remains modest compared to its action in the other sectors. Up to June 25, 1989 a total of 570 standards have been adopted but only ten of which were related to packaging.

d) Every year SASO elaborates a standardization programme based on proposals and recommendations formulated by different concerned sectors. This programme is subject to SASO board of director's approval in the light of priorities and national needs in the field. The standard prepatory phase is the one conducted by the general department for standards which comprises seven specialized sections as follows:
- Metrology.
- Mechanical and metal products.
- Chemical and petroleum products.
- Electrical and electronic products.
- Construction and building materials.
- Textile products.
- Agricultural and food products.

Consultations are regularly sought before the standard project elaboration. Such standards are therefore communicated to every concerned part for advice and further proposals before final submission to the board of directors for approval and adoption. Compulsory standards are generally given an adaptation period which varies from two months to 1 year in such a way to allow the industrial instrument to get acquainted with the application of these national standards.

e) The general department for quality control comprises two sectors as follows:

- Standards implementation.
- Certification and quality control.

SASO's action in the field of certification and quality control has already made a significant progress. Several entreprises have received SASO quality label which is managed with competance and rigour it has been met with satisfaction from both the industrialists and the consumers. However, the question is given now for packaging knowing that the almost lack of standards in this field makes certification an almost impossible task, thus reading confusing situations. Quality label is delivered for products but does not cover the packaging.

f) The information Center.

Keeping in mind the vital role of information in decision making, SASO has set up an information center that comprises the following sections:

- Information processing.
- Scientific and technical information
- Library.

The center major function is to spread standardization and metrology related information by every possible means. The center has been computerized for several years and is organized to avail the following information:

- Product standards.
- Specifications.
- Terminology.
- Listing and addresses of Saudi, regional and international related organizations, institutions and public bodies.
- BIS thesaurus respective standard list.
- Saudi standards projects.

The information center is linked to the GCC industrial development organization data bank. Its library comprises a collection of over 7000 titles and 160,000 standard microfiche form copies (ISO, CEI, ASTM etc..). 65 reviews and periodical are regulaly received by SASO. The main technical and scientific works have been analysed and stored in computers in form of extracts which can be consulted at any time.
The center is managed by thirty technicians and administrative personnel including the printing department staff in charge of editing and publishing all SASO documents, reports and publications.

g) SASO has beside its laboratories general department, that will be studied below, a technical instrument that covers the principal fields of its competence, such as the necessary support to the whole standardization, certification and quality control activity.

h) SASO long-dated experience with the national industry constitutes a basis of mutual cooperation and a decisive support for the national economic development in general and the industrial sector growth in particular.

In this respect, SASO activity in the field of packaging through a specialized technical unit and its assistance to industry requirements constitutes logical supplement to SASO overall action.

i) The Kingdom future needs in matters of standardization, certification and quality control together with SASO requirements in developing its scientific and technical tools have been the essential reasons that led the authorities to decide the execution of a large development programme that aims at setting up new installations over a 28,000 m^2 surface. The first step has already been undertaken at a cost of US$26.7 millions. Plans have already been setup for packaging laboratories installation. The technical recommendations of this study would enable to set forth precise definition of the real needs in this respect.

j) Since 1984, SASO has been officially nominated the GCC Organization for Standardization and Metrology.

3.3 Visits to the main manufacturer and user industries.

3.3.1 Major visit packaging industry units and meetings with industrialists were conducted during the 4th and 5th week of the mission with the assistance of the counter-part Mr. Abdulaziz Al-Habdan. The visits covered the following entreprises:

a) - Banawi Industrial Group: Package production based in Jeddah. It produces pure pack system for the packaging of:
   - Milk and dairy products.
   - Corrugated board production.
   - Duplex board production.

b) - Al-Rajhi Co., for industry, packaging production based in Riyadh, metallic cans for fruit juices and gazeous drinks: Production of metalic cans and boxes for industrial oil and paints. Production of corrugated carton.

c) - The national factory for polystyrine packs Co., Ltd: Production of expanded polystyrine packages for food and manufactured products packaging.

d) - Saudi Arabian Glass Co., Ltd., (Jeddah): glass bottle production for fruit juices and gazeous drink packaging.

e) - Al-Zamil Plastics Group (Dammam) - production of PVC, polyethylene and polyester rigid packages.

f) - Bohara Industries Co., Ltd., - spice packaging.

g) - National Est., for production of foodstuff (Riyadh) Al-Rajhi Group: Production of fruit juices (WAHA).

h) - Al-Jomaih Beverages and Car Making Plants (Riyadh) -production of gazeous drink (pepsi).

i) - National Agriculture Development Company - production of milk and dairy products.

j) - SABIC: production of plastic raw materials for packaging industries and other sectors.

The meetings and discussions have based on the following topics:

1- Specifications of raw materials, packaging materials and packages.

2- National standards elaboration and adoption.

3- Quality control and certification.

4- Training and qualified expertise in factories.

5- Packaging raw materials origins and use of the locally produced raw materials.

6- Other questions with respect to production and marketing.

7- Proposals and recommendations. Remarks and conclusions drawn during these visits and meetings with industrialists may be sumed up as follows:

a) Packages quality is in general acceptable. However, the function/service/promotion aspect is hardly rated.

b) Lack of raw material technical specifications and the possibility of controlling them.

c) Daily technical problems are solved with the help of practice. For the time being there is no possibility of local solution of more complex problems such as corrosion.

d) Food product quality control services and laboratories are in general satisfactory (microbiology, protection etc.), and respect rules, regulations and standards in force in this field.

e) On the contrary, package control methods remain very insufficient even in larger industrial groups.

f) Likewise, technical training for technicians and engineers faces a similar situation: It is carried out on site with "Onboard Means" in the case of well structured factories, but it is frequently inexistant in most production units.

g) Selection of a packaging type that would match a manufactured product on food product is most of the time an extremely complex operation. Its solution requires diverse technologies according to the product constraints, and the quality/price relationship.

h) The absence of national standards is a source of difficulty for industrialists when dealing with imported products.

i) The rapid technological growth requires a permanent follow-up through international exhibitions and the latest developments in this field.

In general, almost all concerned industrialists, either manufacturers or users, approve the establishment of a packaging technical center and promise to support it either on industrial basis or through professional bodies such as chambers of commerce and industry.

Some industrialists have expressed precise requirements in the fields of training technical assistance as for the use of packaging materials and packages, design, certification, quality labeling and arbitration on national, regional and international levels.

Packaging role in the promotion of exchanges, particularly on Arab Countries level, is regarded as vital. Harmonizing product standards and specifications has become essential to the exchange development.

Constant coordination and advice exchange between packaging materials and package manufacturers and users has acquired an aspect of imperative necesity for the national economy for import reduction and local production rationalization.

The need of developing programmes that aim at elaborating and adopting specifications and quality standards of packaging materials and packages as well raw materials is a priority is facilitating the correspondant quality control process.

The adoption of preferential prices for the locally produced raw materials, particularly by SABIC, is an incentive way to motivate the use of such materials.
Consummer's protection is a permanent worry. However this requires specialized laboratories, especially in the field of food products and packaging material compatibility.

The necessity of carrying out attentive studies on the consumer's needs in both the Kingdom and the GCC Countries, and adopting package types (shape, category, colour, presentation) in itself a source of motivation.

3.3.2 The recommendations of Yanbu Seminar, held at the end of 1988 under the patronage of King Abdulaziz city for Science and Technology on Packaging industry in the Kingdom, have been formulated as follows:

1- Promote utilization by the national industry and develop its activity in the field of packaging, mainly in that of the locally produced materials.

2- Promote and motivate a close cooperation between national producers of plastic raw materials and the industries of conversion of these materials for the benefit of the national economy and its development objective.

3- Invite national institutions acting in research / development to follow-up the technological growth in this respect, execute research/development programes in this field and ensure its diffusion among national industries, give priority to research related to packaging industry, mainly food sectors and invite private sectors to participate in research/development activies. Participants in that seminar recommended the creation of a data bank that would be specialized in the field so as to meet the demand in this industry for techniques, different production types, market situation and the main sources of raw materials.

4- Invite industrialists and companies to promote the employment of national technical and administrative manpower and assure its continious training, have recourse to available national expertize in this field, organize seminars and workshops under the patronnage of chambers of commerce and industry so as to carry on with idea exchange in this respect.

5- Invite the ministry of industry and electricity and the other concerned parts to promote industrial project in this field, as well as material and package recycling and production of necessary raw materials specially those of national origin.

6- Promote the organization of specialized exhibitions in the field of packaging so as to garantee the information of all those concerned by this industry.

7- Accelerate the elaboration and execution of Saudi Standards with regard to local and imported packaging materials and develop corresponding equipment and instruments in order to guarantee standards and specifications control.

3.4 Survey of SASO technical department.

SASO laboratories are comprised in a General Department which consists of two sections:

- Metrology laboratories.
- Quality control laboratories.

3.4.1 Metrology laboratories; recently created, they already sheller the necessary equipment that would help face the main problems of calibration and measurements required by public authorities, industrialists and other concerned bodies. An extension and reinforcement is being executed with the assistance of UNIDO (Project SAU/88/003).
They comprise the following laboratories:

1- Length and dimensional metrology.
2- Mass laboratory.
3- Volume and density.
4- Force and pressure.
5- Electrical
6- Radio frequency and time.
7- Temperature.
8- Radio and TV testing.

The director of metrology laboratories is at the same time the national project director of UNIDO assistance project and UNDP/UNIDO technical assistance activity coordinator.

25 technicians and engineers work in these laboratories (16 of them are Saudi nationals).

3.4.2 Quality control laboratories.

They comprise SASO technical and scientific infrastructure and lie over a surface of about 2200 m^2. These laboratories are divided into several sections as follows:

- Electrical products.
- Pesticides.
- Food products.
- Chemical products.
- Mechanical and steel work products.
- Textiles.
- General materials.
- Construction and building materials.

Other laboratories are being constructed (pipes, thermal products).

80 technicians work in these laboratories endowed with a constantly reinforced equipment.

The technical activity covers three main fields:
- Material and industrial product testing.
- Quality control and certification.
- Industry technical assistance.

Applied test methods are those adopted by national standards. In the event they are not available, international or ASTM Standards are used instead.

Some laboratories partically cover specific work at the request of industrial in the packaging sectors as follows:

- Chemical product laboratory.
- Food product laboratory.
- Material laboratory.

The chemical product laboratory lies on a surface of 280 m^2.

Its activities are related to:
- Industrial product technical study.
- Chemical tests.
- The industry technical assistance.

About 15 technicians work in this laboratory, the packaging activity remains relatively rare. However the human and national resources are significant and may consolidate specific activities, particularly in the fields of food compatibility.
- Food product laboratory lies over a surface of 200 m^2 and comprises.

- A chemical laboratory.
- A microbiological laboratory.
- A corrosion laboratory.
- An organoleptic testing laboratory.

About 20 people work in these laboratories.

As per packaging, the major encountered problems are:
- Drink alteration due to packaging bad quality.
- Metalic can corrosion.
- Migration problems.

Equipment is, on the whole, up-to-date but does not cover packaging problems except for chromotography.
Extension projects are being carried out for meat (cooperation project with Newzealand and some other food products that have been lately introduced such as cookies food and frozen producers.

Material laboratory.

It is the most active and used one for tests on packaging materials; it comprises two laboratories that lie over 240 m^2 (including the new packaging lab) and counts about ten technicians and clerical staff.

The equipment is relatively modern (see attached list in annex VII). Testing methods are inspired from ASTM Standards. 100 to 120 technical reports are produced every year. Like the other laboratories, services are renumerated in accordance with a fixed chart adopted by SASO board of directors. The principal tests carried out are as follows:

- Tensile test in machine direction.
- Tear strength.
- Water absorption.
- Water vapour transmission.
- Elongation at break.
- Thickness.
- Reflection.
- Value of colour.
- Pressure test.
- Compression test.

Packaging material testing methods and tests are carried out by existing equipment. However its reliability is not always a certain metter owing to various constraints:

- Laboratories are not sufficiently equipped and conditioned for paper/board and plastics.

- There are no national standards for most of the tests.

- Officials and technicians need a complementary specialized training.

- There is no test equipment for metallic, glass and rigid plastic packages. The case is similar for transport packages and packaging systems (paletization).

Nevertheless, a complementarity is sought for between the different laboratories. Numerous tests related to general materials are carried out in other laboratories notably that of textile.

M. Abdulaziz Al-Habdane, director of laboratory, has been appointed counterpart for the present study. He has been working for SASO for ten years and has been heading the material laboratory for 2 years. Six other staff members, graduate in material sciences agriculture engineering, 4 are Saudi Nationals, (2 engineers and 2 M.Sc.).

Ties with industry are permanent. The laboratory carries out regular missions on applied research that have been decided by SASO.

3.5 The Standardization and Metrology Organization for GCC Countries.

The other GCC Countries, have a similar packaging industry situation to that prevailing in Saudi Arabia as it is stated by the conclusions and recommendations of the general study carried out within the framework of ARPAC project.

An important element should be mentioned here which consists of the fact that SASO is at the same time the headquarters of the Standardization and Metrology Organization for the GCC Countries. The standardization and metrology organization for the GCC countries is a corporate body declared on 17/7/1984. It enjoys an autonomous budget and its headquarters is in Riyadh. The organization's board of directors is formed of the relevant Ministers of the member states or ther representatives. The board runs the organization and hence sets, the general policy, approves the annual budget, establishes plans, programs and systems, drafts financial, administrative and technical regulations, rules and approves gulf standards.

The organization is currently preparing a comprehensive plan to monitor standardization activities in the GCC Countries. Each member body is being allocated a portion of the task commensurate with its material and human resources. The organization also collects data and retrieves relevant information and makes it available to the concerned bodies. It complies studies and conducts research in support of its activities. It is now taking all necessary measures to establish systems for legal and industrial metrology, for conformity certification and quality marking, and for the dissemination of knowledge and awareness of standardization. Inter alia, the organization also organizes appropriate training courses provides, the member states with technical assistance and participates as an observer in the activities of regional and international standards bodies.

Thus, through the Arab Standards Organization for the GCC Countries, the project will contribute to promote inter-arab action in the field of packaging.

3.6 Elaboration of an operating chart of a packaging center.

The study of SASO structure and activities together with an analysis of the action field and the objective of the future center will lead us to define its main functions and to the consider its operating chart:

1- Tests on packaging materials:
   a- Paper and board laboratory.
   b- Metalic package laboratory glass package Lab. Flexible material package laboratory.
   c- Food complatibility laboratory.
   d- Transport package laboratory (climatic and mechanical tests).

2- Applied research and development.
   a- Applied research.
   b- Design unit.
   c- Studies and development.

3- Training.
   a- Training course and seminars.
   b- Basis courses.

Taking into account the packaging center integration inside SASO, training activity may be included in SASO general programme in this respect providing its corresponding services are reinforced by one or two specialized technicians having the adequate graduation. The same remark is applied to the following fields activities.

- Standardization; the corresponding programme will be carried out by SASO Standardization general department. The programme details are comprised in the project document.

- Documentation/information: SASO information center is satisfactorily competent and able to extend its activities to packaging fields. However the documentation service reinforcement (analysis, data-bank, enquiry service) should be realized within the framework of the project. The centre status will be defined in accordance with its gradual integration within SASO operating chart.

As a first step, it should constitute a technical unit within quality control laboratories. Taking into consideration its specific nature and the forseen extension of its activities to other countries of the region notably GCC. It would however, be preferable to give it a some efficient position at a medium term and organize it in such a way to be an autonomous entity within the laboratories general department. These two last steps are reproduced in Annex V, and aim at setting it on well-founded basis and managing its future development.

Likewise, they should conserned to the two executive phases of SASO new installations.

3.7 Elaboration of necessary staff profiles, their training programme and the equipment specifications.

3.7.1 - Staff

The staff required for the future PC functioning has been defined in the light of the center activity in the three coming years, it comprises:

a) A director of the center; scientific graduation mechanical option/or engineer/experience 10 to 12 years, in industry or a research body.

b- A director assistant; scientific graduation experience 4 to 6 years in a research body. Selected among SASO present staff (technical departments).

c- 9 cadres as follows:

4 responsible for the center laboratories with a scientific and/or technical high school profiles, having at least 2 year experience in similar or equivalent laboratories (equivalent to 4 years industrial experience).

2 responsible for research/development activities, specialized in applied research with a scientific profile and 2 to 4 year experience in an industrial sector or scientific research.

These 6 technicians may be selected among the personnel of the present laboratories a follows; chemistry, food products and materials.

- One person responsible for training activities: Scientific or technical graduation.

Experience: 4 to 6 years in technical training institutions/equivalent to 6 to 8 years in industry (quality control or production section).

- One person responsible for design unit: graduation architecture or decoration arts.

Experience: 4 to 6 years in design and architectural practice/equivalent to 6 to 8 years in printing/graphic art jobs.

- One responsible for documentation and information.
  Graduation: Scientific/technical.
  Experience: Documentation center/research institution.

d- Six Technicians: Technical background.
  Experience : Analysis laboratory/preparator.

3.7.2 Training Programme.

3.7.2.1 Since well-trained and qualified officials are considered of utmost importance for successful project implementation and efficient performance of the centre, strengthening of SASO laboratory personnel capabilities, is given specific care within the frame of the project.

Fellowship training will be organized and implemented with regard to the following main technical fields:

- Structural design, specification and laboratory testing of paper and paperboard retail/consumer packages for applied research, development and quality control purposes.
- Structural design, specifications and laboratory testing of metal, glass and report pouch package for processed food and beverages, for applied research development and quality control purposes.
- Structural design, specifications and laboratory testing of food compatibility, for applied research, development and quality control purposes.
- Structural design, specifications and laboratory testing of food compatibility, for applied research, development and quality control purposes.
- Structural design, specifications, and laboratory testing of transport packages for applied research development and quality control purposes.

- Marketing oriented graphic/packaging/design fundamentals of package printing and related art-works elaboration.

- Structural design, specifications, and laboratory testing of plastic and laminates for retail/consumer packages for applied research development and quality control purposes.

- Computerized packaging information services compatible with ITC'S (International Trade Centre) packaging information service.

- Organization, progammation and carry out of packaging training courses for managers and technicians, from packaging manufacturer and user industries.

- Study, programmation and carry out of a packaging standardization programme, certification and quality control purposes.

- Study, programmation carry out of a packaging research/development programme in the field of plastic packaging substitute, on food processed industry.

Training courses should take place in both specialized laboratories and factories producing packaging materials and packages together with these materials and packages users.

The study tours for PC director and deputy director and other high concerned responsible in the GCC Countries, will be important in view of visiting and observing the equipment laboratory testing, internal programme of activities, its measurement and operation system for conforming and analysis.
Discussion at packaging institutions, not only in industrial countries, but also in development countries with active packaging development programmes, will help to define appropriate places and resources of PC outside extension services to the GCC Countries.

Training detailes programmes will be elaborated in accordance with the staff recruited or appointed for PC different posts.

3.7.2.2 Terms of Reference (TOR).

Title: Programing and implementation of two intensive training courses on packaging technology.

Purpose of project: The purpose of the project, in connection with the subcontract and the framework of the establishment of the Packaging Centre, is to organize and carry out in intensive condensed courses on packaging technology for participants at manager's and technical staff's level from packaging manufacturer and user industries. The cooperation which is envisaged through the subcontract is three fold: to assist the PC in technically organizing a model of general packaging training course, to increase the knowledge of the related local staff on main subjects of packaging science and technology and to give some of the same staff an opportunity to participate as lectures on subjects about which they may feel somehow more knowledgeable and capable to teach.

Duties: Final elaboration of complete terms of reference (TOR) will be made by UNIDO. Clearance of TOR and of a proposed list of specialized universities and/or other packaging training institutions will be processed through the bureau of UNDP in Riyadh, according to the pertaining rules and procedures. The subcontractor will be expected to:

1. Prepare the technical contents programme of a two-week training course on packaging technology according to the referred to above. The course is to be implemented on two different periods acceptable for the subcontract himself, with six to eight months time difference between the both, the draft proformal and dates are to be submitted to the project counter part authorities through UNIDO, who will be responsible for the discussion and clearance procedures.

2. Provide two or three professors or experts at professor's level, one of them acting as subcontractor's team leader, to present the required lectures of the course according to the cleared programme, participation of local technical staff on some/matters/classes will depend on sub-contractor's proposal of specific matters and clearance of candidates from among SASO staff.

3. Actual implement the two intensive training courses and give advice on respective fellow-up, on the basis of own general experience and the specific actual experienced with the subject intensive condensed courses, which in principle are to be implemented at Riyadh or another city of the GCC Countries.

4. Provide the illustrated courses (documents) completed by audio-visuals aids and other training support to the counterparts authorities.

5. Prepare a final report setting out the findings of the training courses activity together with recommendations on further works and action that might be taken by the SASO and other concerned bodies.

3.7.3 Equipment

3.7.3.1 Justification for equipment to be supplied to the Project.

The project planned equipment are essential for the output acquired in due time.

The equipment component of the total input budget amounts to US $ 960,000 which is equivalent to approximately 47 percent of the budget grand total (US $ 2,046,250).

The equipment cost estimation is based on a list of testing instrument and accessories, which might be roughly decided into two main groups and commented as follows:

a) Complementary equipment: required for connection output 1: advanced facilities for accurate performance of research, development and quality control of packaging materials and packages.

   The same equipment will also be used for production of output 1: Research and development programme of the most appropriate application of plastic raw materials in the packaging industry. This equipment will be delivered in two phases:

   First phase. Equipment for paper board, metal, glass, plastic and laminate laboratory testing.

   Second phase. Equipment for transport packages laboratory testing and food compatibility laboratory.

b) Several equipment items are available in material laboratory as well as SASO other sectorial laboratories. These items, marked with asteric** in annex III lists, should not be acquired unless in absolute and urgent necessity conditions.

c) Equipment items such as the inclined plane, the big and small drum, generally installed in the transport packaging mechanical and climatic test halls, have no been included in the proposed final list because of their out-of-date aspect. The have been replaced by a shock machine. The latter is capable of reproducing similar simulations.

d) Packaging design unit equipment, which is planned in output 1.2, will be used for the production of output 1.6.

e) The initially envisaged equipment for the pilot factory, within the framework of a research programme applied on the use of plastic materials in packaging industry, has been itemized "for memory" in the expectancy of carrying out a study on specific needs in accordination with SABIC projects in this respect.

f) The counterpart institution has already a qualified technical staff who will have no difficulty in dealing efficiently with such equipment.

g) The timing/planning of equipment delivery and the related activities and inputs have been adequately considered. Thus when the first phase equipment has been delivered on the project site, the trainees should have completed this training course and returned home. It will only be then that the respective international expert should be fielded.

h) The necessary infrastructure and services required for the project first equipment installation are available except those related to paper board air-conditioned laboratory which is to be locally executed in accordance with international standards. As per the mechanical and climatic test hall, the corresponding building construction shall be carried out during the project two years, as the installation of such equipment is due in the project third year.

i) The project equipment maintenance and servicing will be carried out in different ways.

- Firstly under an agreement by the supplier of the major equipment for a specific period.
- Secondly by the staff trained by same supplier.
- Thirdly by the servicing facilities already available in SASO.

j) test instrument calibration should be carefully taken into account. As a matter of fact this element provides for the laboratory seriousness and credibility and may be dealt with under an agreement internationally renowned bodies in the field of calibration.

3.7.3.2 LIST OF MAJOR EQUIPMENT FOR PACKAGING LABORATORIES

(1) Paper-Board Laboratory

Item No.	Priority	Equipment	Specifications standards tests.	Cost US $.
1.1*	A	Climatic cup board for air conditioning (465-t20°)	ISO 187	P.M.
1.2	A	Corrugated Medium Tester (Concora)	ASTM 1.164 ASTM 2.806	10.800
1.3	A	Precision scale maximum 200g	ISO 536	1.200
1.4	A	Rough scale maximum 10,000g	ISO 536	1.200
1.5	C	Thickness tester (Digital)	ISO R534 ISO R3034	8.600
1.6**	C	Electronic tensile and compression tester (INSTRON)	ISO 1274 & 3035/BIS3037	36.000
1.7**	B	Dynamic stiffness tester	TAPPI 4489 ISO/DP 5629	6.000
1.8	A	Brightness and opacity tester	Technibrite Model TB1/TM1	4.000
1.9	A	4. Point bending stiffness	Load ranges 5, 25, 50, 200 g/cms complete w/motor	3.600
1.10	A	Burst tester for paper and flat board	ISO 2758	2.400
1.11	A	Burst tester for all kinds of corrugated board	ISO 2759	4.800
1.12	A	Tear tester for paper & board	0 to 10 dan ISO/1979	2.400
1.13	A	Puncture tester	ASTM D981 - ISO 3036	2.800
1.14	A	Water absorption tester (Cobb kit)	ASTM 2385 ISO 335	1.600

Item No.	Priority	Equipment	Specifications standards tests.	Cost US $.
1.15**	A	Microscope (workshop)	Horizontal & vertical scales	2.00(
1.16	A	Perforameter fin corrugated board	ISO 2876	12.00(
1.17*	B	3 ton press equipment with recorder	Model L + W Cole 47-CTT 3000 or equivalent	24.00(
1.18	A	Oil and grease resistant of paper	One set	2.00(
1.19	A	Stapling and stitching device		4.00(
1.20	B	Specimen cutting		1.20(
1.21	A	Tests specimen	RCT, ECT CMT AND CCT	2.00(

Sub total approximate costs US $ 132,60(

** To be purchased only if a major and urgent need arises during project's life

(2) Metal Glass, plastic and laminate laboratory

Item No.	Priority	Equipment	Specifications standards tests.	Cost US $.
2.1	A	Hardness tester Micros to measure prints (ampli x 20) + std. sheets	Rockwell superficial - hardness RH 30 T (ISO/R1029 Rockwell hardness ISO R80 Brinell hardness ISO R624 Vickers hardness ISO R624 Hard rubber hardness	4.80C
2.2	A	Crimp projector electrical SAW & accessories	Amplification 20 times Crimp control	3.60C
2.3**	C	Universal Stoves (T20-200°C)	Varnish drying Humidity ratio Drying	3.60C
2.4	B	Precision scale	Varnish load measuring	1.80C
2.5	A	Porosity tester	Precision ± 0.1 ml	2.00C
2.6	A	Thickness gauge (measurement of bottles)	Dial range: 0.5 mm/2.5 cm Dial diameter r5 cms Dial gradation 0.02 m/m	1.40C
2.7	A	Gas pressure tester	ASTM 147.50	4.80C
2.8	A	Impact pendulum	Maximum capacity 40 Kg/cm measuring sizes 40 Kg/cm 10 Kg cm 5 Kg cm	0.90C
2.9	A	Straffing device	Suitable for: a) Metallic straps b) Non metallic straps c) Wire tying semi automatic	1.600
2.10	A	Overheat sewing machine for bags	One set. closure device for plastic bag	1.000
2.11**	B	Sterilizator	Capacity 100L	1.200

Item No.	Priority	Equipment	Specifications standards tests.	Cost US $.
2.12	A	Laboratory heat sealing apparatus	L & W/BK temperature from 50° to 300°C	0.50C
2.13	A	Shrink tunnel	Temperature range 100 - 150°C and automatic temperature control	6.00C
2.14	A	Electrostatic field meter	Portable battery operated model	1.60C
2.15	B	Thermohygrographs	For 24 h/7 days recording clock work driver - Max 50°C	0.800
2.16	A	Oxygen analyzer	For measuring oxygen in head space of gas flushed flexible packages	0.400
2.17	A	Vacuum packing apparatus	Laboratory model for flexible and rigid containers	3.200
2.18**	B	X-Y Recorder	Potentiometric type	5.200
2.19**	B	U.V. Recorder	Lumiscript 153-6 with all accessories	6.800
2.20	A	Flat bed recorder	Single per recorder	2.800
2.21	A	Two-channel flat bed recorder (Double pen recorder)		3.400
2.22	A	Water Vapour Permeability tester W/printer & recycler	ASTM L-96 W825/W910 ISO 278 Thwing-Albert	26.000
2.23	A	Gas Permeability tester (films, papers and estimates)	ASTM D 1434 ISO 2556	24.000
2.24	A	Gas Permeability bottle tester	Model Libby L90	20.000
2.25	A	Dart Drop Apparatus	ASTM D 1709 and D 3029 with digital display	7.400

Item No.	Priority	Equipment	Specifications standards tests.	Cost US $.
2.26	A	Transparency haziness	Hazemeter ASTM D1003	10.000
2.27**	B	Tape adhesion tester	Molauin thwing-albert	1.000
2.28**	B	Fluidity index tester	ASTM D1238 ISO 292	0.600
2.29**	B	Thermostated column (densimeter)	ISO R/1183	
2.30**	B	Analytical scale	Max 10 kg digital indication	1.200
2.31	A	Hydrograph portable	Indication of temperature and RH	0.400
2.32**	C	Sterilizator	Capacity 100 L	1.200
2.33	A	Manometer	Can internal pression measuring	0.200
2.34	A	Cutters	2 sets	1.000
2.35	A	Glue breading machine for tape tester	Gluing and fumming machine max speed 20 m/min.	2.000
			Sub total approximate costs US $	150,800

** To be purchased only if a major and urgent need arises during project's life

(3) Food Compatability Laboratory*

Item No.	Priority	Equipment	Specifications standards tests.	Cost US $.
3.1	B	Sorbone (hote x 2) (densimoter)	Solvents, gaz odour evacuation (two)	5.000
3.2**	B	pH - meter	Digital indicating ISO/6588 ISO/1148 ISO/TR 3485	0.500
3.3**	B	Muffle furnaces	Max 40 = 1.400°C ISO/2144	0.800
3.4	B	Universal stove	50°C - 250°C	2.500
3.5**	B	Precision scale (2)	Max load 160 g Max load 10 g	1.600
3.6**	B	Work-shop	Fibre composition analysis	0.400
3.7**	C	Climatic enclosure	Max $1m^3$	3.600
3.8**	C	Distillating apparatus		0.400
3.9**	B	Spectrophotometer ** with atomic absorption	Specific and overal migration	45.000
3.10	A	Vacuum packing apparatus	With vacuum pump, gauge and screening	0.400
			Sub total equipment costs US $	63.800

* The materials packaging laboratory testing will can use for food compatibility testing.

** To be purchased only if a major and urgent need arises during project's life.

(4) Transport packaging laboratory

Item No.	Priority	Equipment	Specifications standards tests.	Cost US $.
4.1	A	Climatic chamber	Volume 20 m3 Temperature range: -20°C to 100°C ± 1°C Humidity range: 20% to 95% RH ± 2% RH With possibility to apply a recorder heating and humidity cycle - all data in C and metric system.	42.000
4.2	A	Climatic cabinet	Vol: 1 m3 Cold-heat-humidity -20°C to + 125°C	14.000
4.3	A	Climatic cabinet	Vol: 1 m3 Cold-heat-humidity -40°C to 100°C	28.000
4.4	A	Climatic cabinet	Vol: 250 dm3 + 100°C - U.V. and pulverization Power 10T	18.000
4.5**	B	Compression tester for strength on package	Electronic TMI or CT 10.000 with recorder	65.000
4.6	A	Electro magnetic drop table	For study the properties of cushioning materials in dynamic conditions	12.000
4.7	A	a) Mechanical drop - table b) Height and angle device c) Release device for the above.	For straight edge or corner drop testing of containers (boxes, bags etc. (ASTM 775-61).	9.000
4.8	A	a) High performance vertical vibration systems and accessories	Capacity 50 to 1000 Kg Electronic components (at frequency range) for monitoring of vertical/horizontal deplacement and frequency (MTS) 5.400 Kg - (MTS).	80.000
	A	b) Sismic mass		18.000

Item No.	Priority	Equipment	Specifications standards tests.	Cost US $.
4.9	A	Shoc-Machine and accessories	Hydraulic system type Trebel	38.000
4.10	A	Potence de chute	Surface plane MODEL MTS	1.500
4.11	A	Vibration table for retail packages	Capacity: 50 Kg Model TMI	4.000
4.12**	B	Mechanical strength tester	For plastic containers	2.000
4.13	A	Hydraulic hand pallet truck	Type BT L. 2000 B	1.200
4.14	A	Electric gerbeus	Type BT LSF 1.200	8.500
4.15**	B	Psychrometer (moisture tester).	Electronic type + 20° to 50°C with the register proof mercury batteries.	0.800
4.16	A	Water - O - meter	For studying aging characteristics of packages and packaging materials under different weather conditions ASTM 623.69 Combinations 625.70 6.500 xenon arc/sunshin carbon arc. ...	104.000
4.17**	B	Air compressor		0.400
4.18	A	Brouillard-Salin cabinet	1.200 BS	4.600
4.19	A	Point voulant	P.2. 5T	16.000
				======

Sub total equipment costs US $ 470.600

** To be purchased only if a major and urgent need arises during project's life.

(5) Packaging design unit

Item No.	Priority	Equipment	Specifications standards tests.	Cost US $.
5.1	A	Ratiograph for photo reproduction with screen plates, motor and accessories		
5.2	A	Non-photographic headline machine of the type varigraph head writer-with accessories		
5.3	A	Letracet		
5.4	B	Designer's table		
5.5	B	Designer's instruments box		
5.6	A	Set of rotring type drawing pens with ink		
5.7	A	Set of French curver		
5.8	A	Visiometer for colors		
5.9	A	Oxfort impact-image tester	Model (TMI) 171	
5.10	A	Printability dynamic	Model (TMI) 175	
			Sub total equipment Total US $	12.00(

3.8 Elaborate a draft Project Document.

(See attached Annex VI).

3.9 Budget

Packaging center budget has been divided into two parts:

3.9.1 Government budget:

It comprises human and material resources that SASO will be able to avail for the carrying out and operation of the center during the first three years. These inputs involves as well the new laboratories construction costs the personnel saleries, the laboratories management costs and those of activities scheduled in the center programme.

Components		Cost US $
a:	Salaries	648,000
b:	Installation and operation	240,000
c:	Technical activities management	
	- Training.	180,000
	- Standardization	P.M.
	- Research/development	80,000
	Total cost for 3 years	US $ 1,148.000
d:	Construction 1.200m^2 x 300	$ 360.000
	Total cost US	$ 1,508.000

3.9.2 UNDP Budget:

The UNDP budget amount US $ 2046.000 with the following components:

2.1 International Staff

Post	Title	Total m/m	Required actual date (month)
11.01	One senior packaging adviser/CTA	36	1
11.02	One expert in plastic packaging and laboratory testing for applied research development and quality control purposes.	12	11

Post	Title	Total m/m	Required actual date (month)
11.03	One expert in structural design and laboratory testing of transport packages for applied research, development and quality control purpose.	8	22
11.51	One expert in paper and paper based retail/consumer packages structural design specifications and laboratory testing for applied research, development and quality control purposes.		
11.52	One expert in metal glass and flexible packaging of processed food products and beverages with specific experience of laboratory testing programmes for shelf life estimation purposes.	6	10
11.53	One expert in market oriented packaging design and development for high level of consumers.	2	12
11.54	One expert in packaging standardization certification and quality control purposes.	6	10
11.55	One expert in computerized packaging information services.	2	10
11.56	Undefined short-term consultants	8	4
	Total Experts and Consultants. 83/mm	Cost US $ 845.250	

All international staff (experts and consultants) are expected to prepare final reports setting out the findings of their missions and their recommendations for future action. The detailed terms of reference are in Project Document - Annex IV.

2.2 Subcontract

- One subcontract with a university of packaging engineering to cooperate in the programming and implementation of two intensive training courses for engineers and technicians from Saudi Arabia and other GCC Countries.

Total cost of sub contract US $ 60.000

2.3 Training

2.3.1 Fellowships (to be completed by)

- One fellowhip of three month duration on paper and paperboard retail/consumer packages structural design, specifications and laboratory testing for applied research development and quality control purposes. Month 12

- One fellowship of six month duration on physical - chemical tests on metal, glass and plastics, retort pouch packaging of processed food and respective laboratory testing for applied research development and quality control purposes. Month 12

- One fellowship of three month duration on flexible packaging and laminate packages structural design, specification, and laboratory testing for applied research development and quality control purposes. Month 12

(to be completed by)

- One fellowship of six month duration on structural design specifications and laboratory testing of transport packages for applied research development and quality control purposes. Month 20

- One fellowship of three month duration on marketing oriented graphic packaging design, fundamentals of package printing and art-works elaboration. Month 12

- One fellowship of three month duration on computerized packaging information services with cooperation of ITC and other specialized institutions. Month 9

- One fellowship of three month duration on organization programming and implementation packaging training courses for managers and technicians from packaging manufacturer and other user industries. Month 9

- One fellowship of six month duration on elaborating programming and implementation of packaging research and development studies particularly oriented to plastic packaging and food packaging industries. Month 12

- One fellowship of three month duration on packaging standardization.

Total cost of fellowships US $: 97.200

2.3.2 Study tours

Expected participants	Duration m/m	To be Completed by	Expected country and Institutions
Director, PC	1	Month 12	FRG, UK, USA
Deputy Director, PC	1	Month 12	MOROCCO, TURKEY KOREA
Director PC and members	1	Month 24	JAPAN - INDIA
of the standardization	5	Month 24	UK - FRG, AUSTRIA
& Metrology Organization	---	Month 12	- ITC -
for GCC Countries.	8	Month 12	

Total Cost of study tours US $: 48.000

2.4 Mission Costs

A sum of US $ 20,000 has been provided for mission and tripartite review costs.

2.5 Equipment and supplies

a) Non-expendable equipment for the value of US $ 927,800 is to be procured through UNIDO; the break-down of this non-expendable complementary equipment is as follows:

- Paper and paperboard laboratory testing	$ 132,600
- Physical and chemical test laboratory (metal, glass and laminate)	150,800
- Food compatibility and corrosion laboratory	63,800
- Transport packaging laboratory (mechanical and climatic test hall)	470,600
- Packaging graphic and design unit	12,000
- Documentation/information books	14,000
	$ 843,800
- Spare parts and replacement of 10%	84,000
	927,800

b) Expendable equipment (Consumables) 32,000

Total equipment components US $ 959,800

2.6 Miscellaneous $ 16,000

4.0 Recommendations

4.1 For Industry

- Introduction of "Quality Assurance" services in units of packaging materials and packages production after having determined the users required quality levels.

- Prepare different production specifications as well as variation margin and cost prices so as to elaborate national standards in this field and their application.

- Organize technical training seminars in common effort and by activity branch paper/board metal, glass, plastics etc., and request for this purpose, technical assistance from organizations and national institutions.

- Use as much as possible local potentials in testing materials and packages together with available technical assistance.

- Organize an international exhibition of industrial equipment, innovations, design agencies in Saudi Arabia together with an international seminar on new technologies in the field of food product packaging.

4.2 For SASO

- Develop the existing laboratories, mainly that of materials, with more modern equipment and testing methods which are adapted to local conditions.

- Develop test standards and others for the principal packaging materials and packages used in the field of food product on the one hands and hazardous products on the other hands.

- Invite industrialists to attend test operations so as to create a constructive dialogue and allow industry technical department to have a better knowledge of the available technical and scientific infrastructure.

- Organize training seminars in different fields related to packaging and participate in the elaboration of a training course destined to food engineering.

- Participate to the carrying out of a research/development programme in the field of plastic packaging in close coordination with SABIC and other concerned institutions and industries.

- Prepare a transport packaging test laboratory in order to facilitate the elaboration, adoption and application in the Kingdom of national standards of dangerous products and food products as a priority.

- Take up the initiative, in connection with the concerned parts, to elaborate a study on different packaging material rehabilitation in order to motivate public authorities and industrialists to both the appropriate measures in this respect.

- Organize, the earlist possible, a study trip for 3 or 4 SASO high ranked engineers in order to visit packaging institutions/centers in India, Morocco, Turkey, South Korea, Great Britian and West Germany etc. This trip will also include a visit to an international packaging exhibition (Inter-pack, Dusseldorf (W.G.), Tokyo Pack).

- Reinforce SASO information center through the creation of a packaging section.

At Regional Level

- Study and adopt an activity programme at GCC Countries and other Arab Countries level in the following fields: Technician and staff training, material a 1 packages test method standard harmonization, documentation/information. This programme will be attended by UNDP, UNIDO, AIDO and ICO for GCC Countries.

- Study a standardization guideline for materials and packages particularly in food packaging.

- Offer technical assistance to Arab Countries which do not dispose of a scientific and technical infrastructure in this field with the assistance of UNIDO and other specialized organisms.

ANNEX I

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
PROJECT IN THE KINGDOM OF SAUDI ARABIA.
JOB DESCRIPTION

UC/SAU/88/ /11-01/J 13105

Post Title	Expert in Packaging Research and Quality Control Institutions.
Duration	Three Months
Date Required	November 1988
Duty Station	Riyadh with Possible Travel in the Country.
Purpose of Project	High-level advice to the Government regarding the possible establishment of a packaging centre at the Saudi Arabian Standards Organization.
Duties	The consultant will be assigned to the Saudi Arabian Standards Organization and will be specifically expected to:

1- Get acquainted with the former project entitled Establishment of the Arab Regional Packaging Centre, particularly with regard to the conclusions and recommendations of the project as a whole and to the identified needs of technical assistance to Saudi Arabia.

2- Get acquainted with the aims, structure and functioning of the Saudi Arabian Standards Organization, as well as its conditions for the establishment of a national packaging centre, intended to perform laboratory testing on packaging materials and packages for applied research and quality control, as well as to provide information, training and techno-economic advice as required by the packaging manufacturer and user industries for effective fast quality improvement.

3- Visit the main packaging manufacturer and user industries to physically observe and discuss, from the demand point of view, the detailed services of institutional technical assistance which would be required in Saudi Arabia and could be made available at SASO, to promote and actively support a national fast development in terms of packaging technology and industries. Simultaneously analyze and discuss the possibility of extension of the same services to the other countries of the Gulf sub-region.

4- Make a survey of the technical departments of SASO, in terms of technical staff and research equipment which could be utilized in co-ordination with a packaging center, in order to secure appropriateness of the complementary resources would be delivered for the establishment of the packaging centre and to avoid as much as possible unnecessary duplication of research and development means and capabilities.

5- Elaborate a detailed organizam of the packaging centre which would be advisable to be installed at SASO, on the basis of the conclusions of the activities above and in close consultation with the concerned counterparts of the mission.

6- Elaborate profiles of the technical personnel which would be required for the packaging centre and basic training programme for the same, as well as specifications for the required testing and other equipment and draft planning of the premises for installation and adequate functioning of the centre as a whole.

7- Elaborate a tentative draft technical assistance project which could be required for the creation, equiping, training and start of regular operation of the packaging centre as defined above, for consideration and appraisal by the national decision making authorities and by the international organizations like UNDP and UNIDO, which could definitively be called for its financing, management and implementation.

8- Elaborate a budget estimate for the first 3 years of operation of the Centre with specific analysis in respect of expenditure and financial resources required.

The expert will also be expected to prepare a final report, setting up the findings of the mission and his recommendations to the Government on further action which might be taken.

ANNEX II

WORK-PLAN

1St Week:	Brieffing UNIDO/VIENNA and Meeting/SASO Organization/Riyadh.
2nd Week:	Analysis of the SASO's aims, structure and functioning.
3rd Week:	Visit of Institutions and other concerned.
4th Week and 5th Week:	Visit of the manufacturer and user industry in the region of Riyadh, Jeddah, and Dammam.
6th Week:	Discussion with SASO management on draft project document.
7th Week:	Meeting with Dr. Khaled Y. Al-Khalaf Director General and survey of the technical departments of SASO.
8th Week:	Visit of Agriculture Companies.
9th Week:	Draft terminal report editing and printing.
10th Week:	Draft terminal report and project document printing.
11th Week:	Meeting and discussion with SASO management of the conclusions and recommendations of final report.
12th Week:	Meeting with Dr. Khaled Y. Al-Khalaf Director General, of SASO. Editing and printing of the report and project document.

ANNEX III

DAILY REPORTS

Ref: Project No. UC/SAU/88/2.1.0/11.01

24 - July 1989:	Travel CASABLANCA - VIENNA (VIA PARIS) FOR UNIDO Brieffing.
25 and 26 July 1989:	Brieffing at UNIDO head quarter with several services.
27 July 1989:	Travel to Riyadh UNDP meeting at the Airport and Welcome.
29 July 1989 AM:	Visit to UNDP office in Riyadh, and meeting with M.A. NAMEK, UNDP Resident representative and M. AMIN deputy RR.
PM:	Visit to SASO's Laboratory and meeting with M. Saad Hussainan Director of the Quality Control Laboratories and M. Abdulaziz Al-Habdan, Head of Materials Laboratory and Designed conterpart for the study.
30 July 1989 AM:	Meeting at SASO Headquarters with M. Nabil A. Molla Deputy Director General of SASO.
PM:	Meeting with M. Fahad A. Salamah Director of the Laboratory General Department.
31 July 1989 AM:	Draft of the technical work plan for the mission and visit at the SASO's Standards Department.
1 Aug. 1989	Visit and meeting at SASO's information centre.
2 Aug. 1989 AM:	Visit and meeting of SASO's standard implementation.
PM:	Visit to UNDP Office/Administration Services.

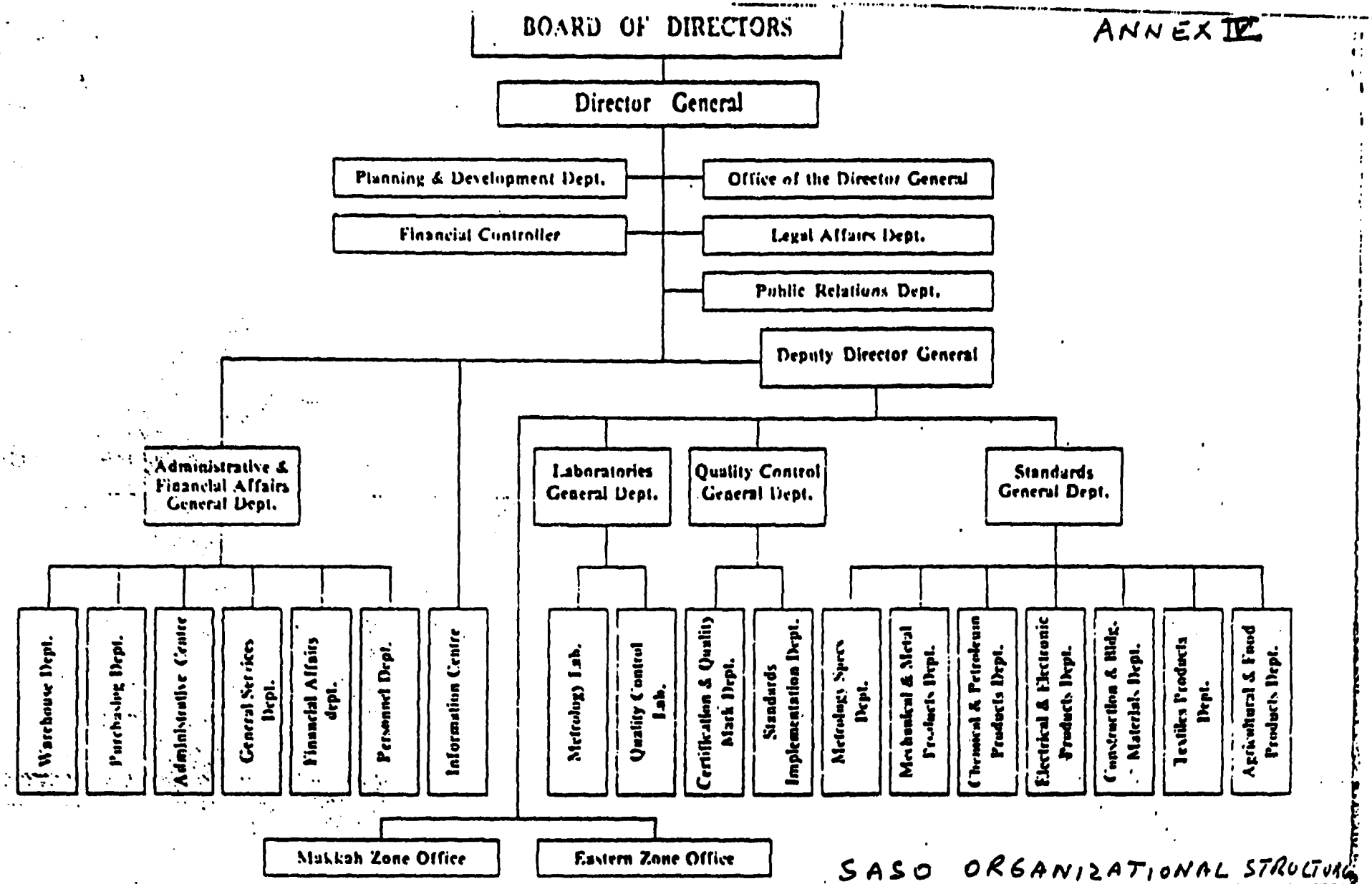
5 Aug. 1989:		Work at SASO Laboratories.
6 and 7 Aug. 1989:		---------- Idem ----------
8 Aug. 1989	AM:	Visit to Saudi Consulting House and Meeting with Mr. Ali A. Arrubai
	PM:	Visit to Metrology Laboratory.
9 Aug. 1989:		Visit to Ministry of Industry and Electricity and Meeting with M. Mahmoud Rochdi, Director of Marketing Department.
12 Aug. 1989:		Visit to BASIC Industries Corporation (SABIC) and Meeting with: M. H.B. OLAYAN. Technology Planning and Evaluation Manager. M. Abdulla M. Bayounis Business Development Manager. M. Zakih Al-Muallem Technical Services Manager.
13 Aug. 1989:	AM:	Visit to UNDP/UNIDO office and Meeting with M. Shah UNIDO Programme Officer.
	PM:	Visit the SASO's Printing and Editing Unit.
14 Aug. 1989	AM:	Visit of the Ministry of Trade and Meeting with Mr. Salah Rashid Al-Amin, Director of the Quality Control Department.
	PM:	Visit to the Quality Control Laboratories, (Ministry of TRADE).
15 Aug. 1989		Work at SASO's Laboratories.
16 Aug. 1989		Visit to Saudi Consulting House.

17 Aug. 1989:		Reading and draft for start of study.
19 Aug. 1989:		Visit to PEPSI - COLA PLANT in Riyadh Industrial area.
20 Aug. 1989	AM:	Visit to SASO's information centre and meeting with M. Abdul Mohsin Al-Yousef Manager of the Centre.
	PM:	Visit to Al-Rajhi Manufacturer for metal cans.
21 Aug. 1989:		Visit to King Abdulaziz City for Science and Technology and meeting with D. Hassan Atayim.
22 Aug. 1989:		Visit to Al-Rajhi Industrial Group, Visit of Fruit juice and corrugated board manufacturers.
23 Aug. 1989:	AM:	Visit to UNDP/UNIDO office
	PM:	Visit to SASO's Laboratories/Textile Laboratory.
26 Aug. 1989	AM:	Travel to Jeddah Visit to Banawi industrial group and meeting with the quality control manager.
	PM:	Visit to styren pack company.
27 Aug. 1989	AM:	Visit to the BOHARA Industries.
	PM:	Visit to the Saudi Arabian Glass Co.
28 Aug. 1989	AM:	Visit to Al-Ghossaibi Industrial Group Pepsicola-Plant.
	PM:	Visit to the UNITED Packaging (Banawi Group), paper/board manufacturer.
29 Aug. 1989	AM:	Visit to the Zamel Plastics for packaging.
	PM:	Visit to Afandi ICE Cream Plant.
30 Aug. 1989		Travel to Riyadh.
3 Sep. 1989		Reading and draft of the preliminary report.

4 Sep. 1989	AM:	Printing of the preliminary report.
	PM:	Visit to SASO's Laboratory.
5 Sep. 1989	AM:	Visit and meeting at Chamber of Commerce and Industry, Riyadh.
	PM:	Visit to UNDP office and submit of the preliminary report.
6 Sep. 1989		Survey of the SASO's materials laboratories.
9 Sep. 1989		Conference on packaging research and quality control institutions at SASO's head quarters.
10 Sep. 1989	AM:	Visit to UNDP office and meeting with M. Ahmed Namek and M. Shah on the project technical and financial contribution of UNDP/UNIDO.
11 Sep. 1989		Meeting with Mr. Nabil A. Molla at SASO headquarters: discussion and analysis of the project framework and activities.
12 Sep. 1989		Meeting with Dr. Khaled Y. Al-Khalaf Director General of SASO.
13 Sep. 1989		Visit to the Council of Saudi Chamber of Commerce and Industry and Meeting with Dr. Gomaa M. Amer.
16 Sep. 1989		Visit to SASO's printing and editing services.
17 Sep. 1989		Visit to SASO and meeting with M. Sirag M. Massode Director General of Standards Department.
18 Sep. 1989		Visit and meeting at SASO's food products laboratory.
19 Sep. 1989		Visit to National Agriculture Development Company (NADEC).

20 Sep. 1989	Meeting with the responsible of Standards Department.
23,24,25 Sep. 1989	Reading of draft project document and draft final report.
26 Sep. 1989	Visit of M. DOMINGO L. SIAZON, Jr. UNIDO Director-General at SASO Laboratories and presentation of the new packaging laboratory.
27 Sep. 1989 To 30 Sep. 1989	Editing of draft, project document.
3 and 4 Oct. 1989	Visit to the SASO's new project construction and meetings with M. OSAMA Abdul Fattah.
6 Oct. 1989	Visit to Saudi Consulting House and meeting with M. AL-Toujeri General Director and M. Al-Hwairini.
7 and 8 Oct. 1989	Reading of the final report draft.
9 oct. 1989	Meeting with M. Nabil Molla Deputy Director General of SASO.
10 & 11 Oct. 1989	Editing and printing of Project Document draft.
15 Oct. 1989	Final meeting with Dr. Khaled Y. Al-Khalaf Director General of SASO.
16 to 23 Oct. 1989	Editing and Printing of the Final Report and Project Document.
23 Oct. 1989	Meeting with M. A. NAMEK UNDP Resident Representative.
24 Oct. 1989	Travel to VIENNA.
25 and 26 Oct. 1989	Debrieffing at UNIDO/VIENNA.

ANNEX IV

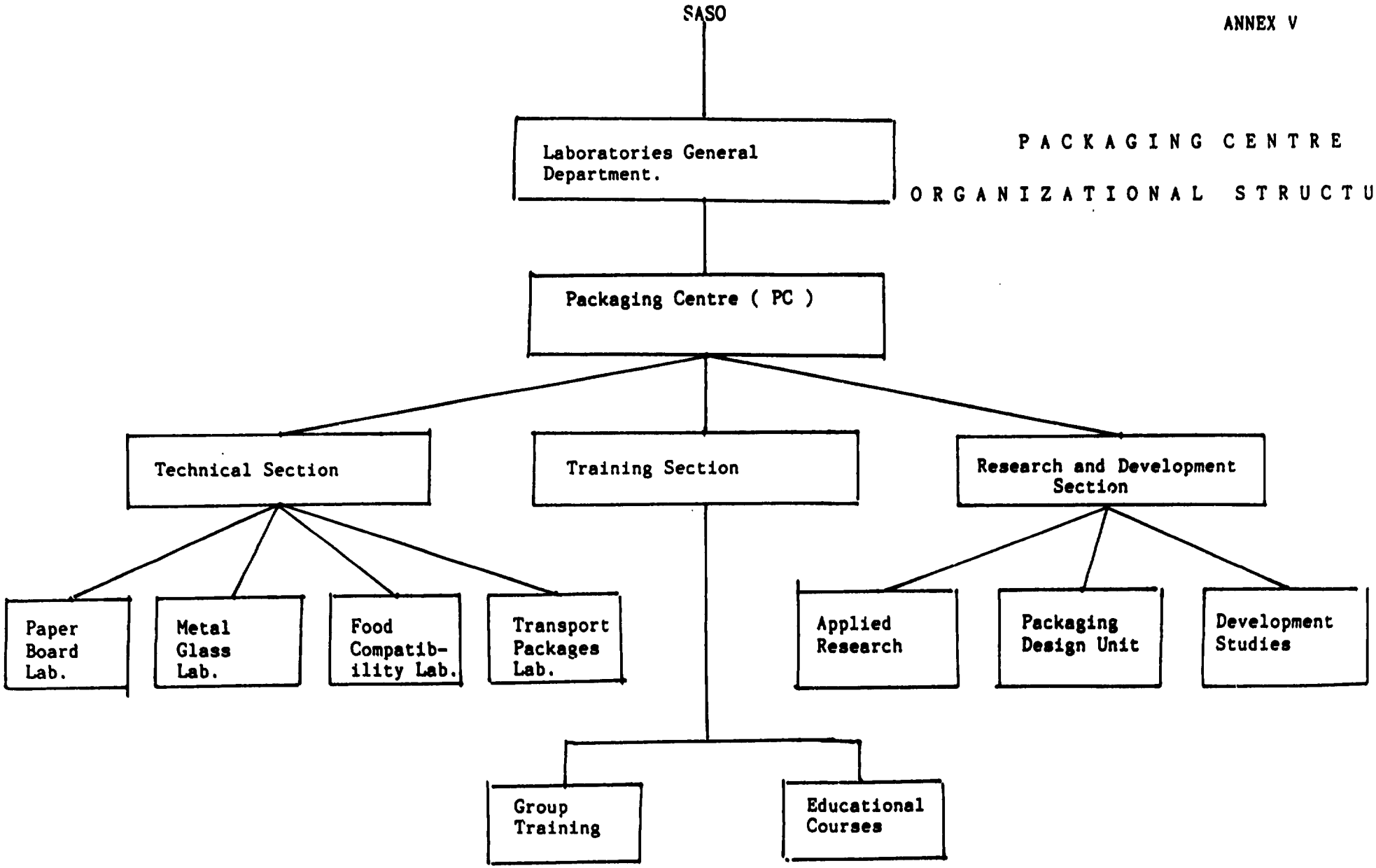


SASO ORGANIZATIONAL STRUCTURE

ANNEX V

PACKAGING CENTRE

ORGANIZATIONAL STRUCTURE



ANNEX VI

List of Equipments
Already Available for Material Testing Laboratory.

Serial No.	NAME & USE OF INSTRUMENTS:	Name of Company
1.	Colorimeter "Measurement of colour compart xyz.	Pacific Scientific
2.	Optical Microscope.	Karl Kolb.
3.	Rubber hardness tester	Wallace
4.	Cobb Tester	
5.	Stiffness Tester "Measure hardness for material.	Karl Frank. GMBH
6.	Tearing Tester	F.G. BODE Co. Hamburg. 90
7.	Flammability Tester	Custom Scientific Instruments INC.
8.	Puncture Tester	F.G. Bodge & Co. Hamburg. 90
9.	Thickness Tester	F.G. Bode & Co. Hamburg 90.
10.	Opacity Tester (Sizing Tester)	F.G. Bode & Co. Hamburg. 90
11	Stiffness Tester	Karl Kolb
12.	Vicat Softening Point	Davenport (London)
13.	Multi Angle Glossometer.	Gardner Lab. Inc.
14.	Reflecto Meter	Erichsen.
15.	Tearing Tester.	Karl Frank GMBH (Kark Kolb.)
16.	Micro-cal Thickness Tester	H.E. Messmer.

Serial No.	NAME & USE OF INSTRUMENTS:	Name of Company
17.	Bending Stiffness Testing	
18.	Water Vapor Transmission Cup. Determination of the Water Vapor Transmission Rate within a Determination time through container material.	
19.	Tensile Testing "Max: 5000 N" Capacity (Textile Lab.)	J.J. Lloyd Inst. limited.
20.	Tensile Testing	TINIUS OLSEN Testing Machine Co. Willow Grove, PA USA
21	Compression Tester, "For Measure Compression (Metrology Lab., and deflection of carton & Container	Testing Machines, Inc. Amityville, L.I. New York.
22.	Lo-Cap. Universal Testing Machine Max. 100 000 N" Capacity	Tinius Olsen Test Machine Co., Willow Crove, PA USA
23.	Weathering Fastness Tester "XENO TEST"	ORIGINAL HANAU Germany.
24.	Bursting Strength Tester (Textile Lab.)	KARL FRANK GMBH (Karl Kolb).