

# UNITED NATIONS ECONOMIC AND SOCIAL COUNCIL



19486  
Distr.  
LIMITED

E/CN.14/INR/66  
3 July 1964

Original: ENGLISH

ECONOMIC COMMISSION FOR AFRICA  
Conference on Co-ordinated Industrialization  
in West Africa  
Bamako, 5-15 October 1964

## NEEDS FOR TRAINED PERSONNEL IN THE CHEMICAL INDUSTRIES

### Table of Contents

	<u>Page</u>
INTRODUCTION ... ..	2
I. NEEDS FOR TRAINED PERSONNEL IN THE CHEMICAL INDUSTRIES ...	3
A. Information required as a basis for determining personnel requirements in the proposed new industries ...	3
B. Illustrative material on existing chemical industries	4
II. VOCATIONAL TRAINING IMPLICATIONS ... ..	11
III. ILO ACTION IN CONNECTION WITH TRAINING FOR THE CHEMICAL INDUSTRIES ... ..	14

## NEEDS FOR TRAINED PERSONNEL IN THE CHEMICAL INDUSTRIES

by

International Labour Office

### INTRODUCTION

The purpose of the meeting on chemical industries organised by the United Nations Economic Commission for Africa at Bamako in October 1964 is to promote the establishment of chemical industries to serve the West African sub-region, after determining which types of chemicals show promise of economic production on a sub-regional basis. The Report of the West African Industrial Co-ordination Mission will help to provide the basis for selecting the types of chemical industry to be promoted.<sup>1/</sup>

Once the lines of sub-regional chemical industry development in West Africa have been decided it will be possible to determine the specific manpower implications of the proposed action. These implications include the requirements for trained manpower in the various occupational categories and at the different levels and the action which should be taken to ensure that manpower has the desired qualifications. At the present stage, however, it is not possible to do more than indicate the type of basic information from which manpower needs may be determined and to discuss briefly the vocational training implications of the action proposed in the light of illustrative material for chemical industries.

A brief description is also given of the work of the ILO in connection with training for the chemical industries and reference made to the co-operation which the ILO might be able to provide if this were desired.

---

<sup>1/</sup> United Nations Economic and Social Council, Economic Commission for Africa, Sixth Session, Addis Ababa, 1964; Document E/CN.14/246, especially paragraphs 66 to 120.

I. NEEDS FOR TRAINED PERSONNEL IN THE CHEMICAL INDUSTRIES

A. Information required as a basis for determining personnel requirements in the proposed new industries

1. When plans for the sub-regional development of the chemical industries in West Africa become more concrete provision will need to be made for securing specific information with a view to determining staffing requirements. It will be necessary for this information to cover:

- (a) the specific products which are to be manufactured;
- (b) the specific technology by which it is planned to manufacture each product;
- (c) any relevant social and economic objectives which might affect the technology to be employed and staffing policy, such as any intention to create additional employment by means of labour intensive methods;
- (d) the size of production units envisaged in terms either of output or of numbers employed. This information is essential since occupational structure will be affected by size - for instance, the larger the unit the more specialisation is possible;
- (e) the scope of the processes to be carried out in each establishment - for instance, mixing or production of components or both;
- (f) available personnel with the general education and technical qualifications necessary as prerequisites for specialised chemical training;
- (g) the number of shifts planned for production units.

../.

2. Once the above information is available it should be possible to work out the specific staffing requirements in the light of this information and practices in similar production units elsewhere. If it is decided to aim primarily at maximum efficiency, for instance, it should be possible to obtain from existing leading chemical plants schedules of staff for the technology and size of unit planned. If, on the other hand, a labour intensive policy is to be followed with a view to the creation of employment, it should be possible to secure staffing schedules from suitable plants already organised along such lines.

B. Illustrative material on existing chemical industries

3. Pending the availability of such precise data information is given below on the occupational structures in certain chemical industries. Data provided are illustrative only, however, and can serve only as a very general indication for further planning. More specific planning must depend on the information indicated in paragraph 1 above.

4. In each table an attempt has been made to group the categories of personnel involved according to whether they are likely - in so far as action in West Africa is concerned - to require training locally or abroad, and according to whether the training involved is particular to the chemical industries.

5. Tabel I gives the occupational structure for the synthetic fibre industry in the U.S.A. in 1960.

TABLE I.  
Synthetic Fibres - U.S.A.

<u>Training Categories and Occupational Groups</u>	<u>Employment</u>	<u>1/ Percent</u>
Total	56,068	100.0
<u>Training Outside Country</u>	3,899	<u>7.0</u>
Professional and kindred (excl. technicians, draughtsmen and related).	3,451	6.2
<u>2/</u> Half-Managers, Officials and Proprietors	448	.8
<u>Training Common with Other Industries</u>	4,390	<u>7.8</u>
Clerical and kindred workers	4,069	7.3
Sales workers	321	.6
<u>Training Particular to Chemical Industry</u>	41,755	<u>74.5</u>
<u>2/</u> Half-Managers, officials and Proprietors	449	.8
Technicians, draughtsmen and related	2,898	5.2
Craftsmen and kindred (excl. foremen not elsewhere classified)	8,555	15.3
Foremen not elsewhere classified	3,810	6.8
Operatives and kindred workers	26,043	46.4
<u>Training not Required</u>	6,024	<u>10.7</u>
Service workers	1,439	2.7
Labourers	2,259	4.0
<u>3/</u> Occupation not reported	2,276	4.1

Source: United States Census of Population 1960, Occupation by Industry  
U.S. Department of Commerce, Bureau of the Census, Final Report  
P.C. (2) 7-C.

- 1/ Due to rounding, percentage subtotals do not in every case correspond to percentages for individual items.
- 2/ An arbitrary assumption was made that half of management group would be top management requiring training outside country and half middle management trainable within the country.
- 3/ Where occupation was not reported it was arbitrarily assigned here. It might have been distributed over the other categories.

6. Table II gives the occupational structure for the artificial and Synthetic fibre industry in France in 1954.

TABLE II

Artificial and Synthetic Fibres - France

<u>Training Categories and Occupational Groups</u>	<u>Employment</u>	<u>Percent</u>
Total	23,280	100.0
<u>Training Outside Country</u>	580	2.5
Top Management	580	2.5
including: engineers	440	1.9
<u>Training Common with Other Industries</u>	2,900	12.5
Clerical and sales	2,620	11.3
1/ Other occupational groups	280	1.2
<u>Training Particular to Chemical Industry</u>	16,540	71.0
Middle management	1,660	7.1
including: technicians	1,200	5.2
Foremen	920	4.0
Skilled workers	4,380	18.8
Semi-skilled workers	9,580	41.2
<u>Training not Required</u>	3,260	14.0
Labourers	3,260	14.0

Source: Recensement général de la population de mai 1954. Résultats du Sondage au 1/20 ème. Population active, 1re Partie: Structure professionnelle, Imprimerie nationale, Paris, 1958, p.152.

1/ This category probably consists mostly of service personnel. It was arbitrarily assigned here.

7. Table III gives the combined occupational structure for basic chemicals, chemical fertiliser manufacture, and industrial explosives and fireworks manufacture in France in 1954.

TABLE III

Basic Chemicals, Chemical Fertiliser  
Manufacture, and Industrial Explosives  
and Fireworks Manufacture - France

<u>Training Categories and Occupational Groups</u>	<u>Total</u>	<u>Percent</u>
Total	41,780	100.0
<u>Training Outside Country</u>	1,650	3.9
Top Management	1,650	3.9
<u>Training Common with Other Industries</u>	5,580	13.4
Clerical and sales	4,740	11.3
1/ Other occupational groups	840	2.0
<u>Training Particular to Chemical Industry</u>	24,810	59.4
2/ Middle Management	2,350	5.6
2/ Foremen	2,040	4.9
Skilled workers	9,220	22.1
Semi-skilled workers	11,200	26.8
<u>Training not Required</u>	9,740	23.3
Labourers	9,740	23.3

Source: Recensement général de la population de mai 1954.  
Résultats du Sondage au 1/20 ème. Population active,  
1re Partie: Structure professionnelle, Imprimerie  
nationale, Paris, 1958, pp.145, 146.

1/ This category probably consists mostly of service personnel. It was arbitrarily assigned here.

2/ Components from "Industrial Explosives and Fireworks Manufacture" estimated. See footnote 2 and 3 for TABLE IV.

8. Table IV gives the occupational structure for the basic chemicals industry in France in 1954.

TABLE IV

Basic Chemicals - France

<u>Training Categories and Occupational Groups</u>	<u>Employment</u>	<u>Percent</u>
Total	24,820	100.0
<u>Training Outside Country</u>	920	3.7
Top management	920	3.7
incl: engineers	640	2.6
<u>Training Common with other Industries</u>	3,420	13.8
Clerical and sales	2,840	11.4
1/ Other occupational groups	580	2.3
<u>Training Particular to Chemical Industry</u>	15,040	60.6
Middle management	1,320	5.3
incl: Technicians	600	2.4
Middle level administrative staff	640	2.6
Foremen	1,420	5.7
Skilled workers	5,900	23.8
Semi-skilled workers	6,400	25.8
<u>Training not Required</u>	5,440	21.9
Labourers	5,440	21.9

Source: Recensement général de la population de mai 1954. Résultats du Sondage au 1/20 ème. Population active, 1re Partie: Structure professionnelle, Imprimerie nationale, Paris - 1958, p.145.

1/ This category probably consists mostly of service personnel. It was arbitrarily assigned here.



9. Table V gives the occupational structure for the chemical fertiliser manufacturing industry in France in 1954

TABLE V

Chemical Fertiliser Manufacture - France

<u>Training Categories and Occupational Groups</u>		<u>Employment</u>	<u>Percent</u>
Total		11,420	100.0
<u>Training Outside Country</u>		560	4.9
Top management		560	4.9
<u>Training Common with Other Industries</u>		1,620	14.2
Clerical sales		1,420	12.4
1/ Other occupational groups		200	1.8
<u>Training Particular to Chemical Industry</u>		5,720	50.1
Middle management		860	7.5
incl: Middle level administrative staff		720	6.3
Foremen		500	4.4
Skilled workers		1,840	16.1
Semi-skilled workers		2,520	22.1
<u>Training not Required</u>		3,520	30.8
Labourers		3,520	30.8

Source: Recensement général de la population de mai 1954.  
Résultats du Sondage au 1/20 ème. Population active,  
1re Partie: Structure professionnelle, Imprimerie  
Nationale, Paris, 1958, p.145

1/ This category probably consists mostly of service personnel.  
It was arbitrarily assigned here.

10. Table VI gives the occupational structure for the industrial, explosives and fireworks, manufacturing industry in France in 1954.

TABLE VI

Manufacture of Industrial Explosives and Fireworks - France

<u>Training Categories and Occupational Groups</u>	<u>Employment</u>	<u>Percent</u>
Total	5,540	100.0
<u>Training Outside Country</u>	170	3.1
2/ Top management	170	3.1
<u>Training Common with Other Industries</u>	540	9.7
Clerical workers	480	8.7
1/ Other occupational groups	60	1.1
<u>Training Particular to Chemical Industry</u>	4,050	73.1
2/ Middle management	170	3.1
3/ Foremen	120	2.2
Skilled workers	1,480	26.7
Semi-skilled workers	2,280	41.6
<u>Training not Required</u>	780	14.1
Labourers	780	14.1

Source: Recensement général de la population de mai 1954.  
Résultats du Sondage au 1/20 ème. Population active,  
1re Partie: Structure professionnelle, Imprimerie  
nationale, Paris, 1958, p.146.

- 1/ This category probably consists mostly of service personnel. It was arbitrarily assigned here.
- 2/ Estimated from combined figure for top and middle management. It was assumed arbitrarily that the personnel concerned were equally divided between the two categories.
- 3/ Estimated from total figure for "workers". It was assumed that this figure, the residue when the totals for skilled and semi-skilled workers and labourers were deducted from the total for "workers", consists largely of foremen. It may, however, include a few apprentices as well.

## II. VOCATIONAL TRAINING IMPLICATIONS

11. The tables presented above give an idea of the large proportion of personnel in the chemical industries planned for West Africa which is likely to require training. They also suggest the proportion for which training will probably need to be organised abroad and the categories for which training in West Africa should be practicable, as well as showing the proportion whose training may be particular to the chemical industry.

12. The chemical industries are highly technical and scientific and, for this reason, it is particularly important that their labour force should have systematic and comprehensive training in the light of the specific requirements of their work. The tasks which personnel will be called on to perform will not, however, be known exactly until the specific manpower requirements are ascertained in the light of the information indicated in paragraph 1. Any suggestions as to desirable training action can therefore be general only and, to some extent, hypothetical.

13. It is evident that, in any case, plans for organising the necessary training will need to be prepared and put into operation in good time in order that the trained manpower required may be available when the new chemical industries are being established. Action will need to be co-ordinated with national training action as a whole. It is also clear that it would be desirable to make use, to the greatest extent possible of existing training facilities, with the addition of specialised

../.

sections as necessary to meet the requirements of training particular to the chemical industries. The chemical industries themselves have to a large extent organised training for their own needs in the industrially advanced countries and it would seem essential for their active collaboration to be enlisted at all stages of training action for the new industries to be developed in West Africa.

14. It has been noted that a large proportion of the manpower required is likely to need "particular" training. In the circumstances, it will probably be necessary to foresee special arrangements for the rapid training of the labour force initially required and to provide, in parallel, for the longer-term training of other specialised personnel. It may be assumed that needs for certain categories will not be sufficient to justify the establishment in each country of training facilities for these categories. In such cases it would seem desirable to foresee the organisation of sub-regional training facilities to serve the needs of the different countries participating in the scheme. Arrangements of this kind may well be necessary for key members of the initial labour force and particularly for technicians, supervisors and highly skilled workers. The arrangements might also cover instructors who, with supervisors, can be responsible for giving training in the individual countries, especially within the new plants.

15. The work of chemical engineers is highly specialised and the numbers required will not be very great. It seems probable

that basic and adaptation training for this category should be organised in industrialised countries which already have the necessary training facilities, including possibilities of giving periods of practical experience in suitable chemical plants. The statistical tables have foreseen that chemical engineers and other senior management personnel should be trained abroad.

16. It may also be desirable to envisage practical experience in chemical plants abroad for certain key workers and supervisors who already have the basic qualifications. This might be arranged along the lines of the worker-traineeships organised by the ILO or within the framework of the programmes of the ILO International Centre, at Turin for Advanced Technical and Vocational Training.

17. A detailed description is not given here of the forms which training for the different categories of personnel in the chemical industries might take, in view of the uncertainty as to the types and numbers of personnel which will be required.

Information on training for the chemical industries is, however, available in a number of ILO publications and can be supplied on request. The main publications in this group are listed in the chapter which follows:

### III. ILO ACTION IN CONNECTION WITH TRAINING FOR THE CHEMICAL INDUSTRIES

18. The question of vocational training for workers in the chemical industries has engaged the attention of the I.L.O. Chemical Industries Committee to some extent at each of its sessions. Training as a whole for the industries was considered in particular at the third session in 1952. This meeting had before it a detailed report on Vocational Training in the Chemical Industries,<sup>1/</sup> in the light of which the Committee adopted a resolution setting out the lines on which training for these industries should be organised.<sup>2/</sup> Inquiries on the subject have been carried out on a continuing basis since that time and the results have been presented in the general reports prepared for successive meetings of the Chemical Industries Committee, particularly those for the Fifth and Sixth Sessions.<sup>3/</sup> The results, as far as training for process equipment operators was concerned, of a special inquiry carried out in 1957 at the request of the Fourth Session of the Committee, were also presented in an article in the International Labour Review in 1958.<sup>4/</sup>
19. The inquiries into vocational training aspects have involved studies of the occupational structure of, and the composition of the occupations in, the chemical industries.

---

<sup>1/</sup> Chemical Industries Committee, Third Session, Geneva 1952: Report II.

<sup>2/</sup> Resolution (No.13) concerning vocational training in the chemical industries, ILO, Official Bulletin, Vol. XXXV, No. 3, 20 December 1952.

<sup>3/</sup> Chemical Industries Committee, Fifth and Sixth Sessions, Geneva, 1958 and 1962, Report I in each case.

<sup>4/</sup> "Training for Process Equipment Operators in the Chemical Industries", International Labour Review (ILO, Geneva), Vol. LXXVIII, No.4, October, 1958.

This work is continuing and the chemical industries will be included in a special programme which is foreseen for the preparation of standards applicable to training in given industrial sectors. It is envisaged that these standards will be based on the identification and selection of functions and key occupations in the industries concerned; the determination of the qualifications required; the determination of the content, duration and conditions of training; a study of the organisation of training in the industries; and a study of employers' and workers' organisations' participation in the preparation and implementation of training programmes.

20. On the operational side I.L.O.'s work in connection with the determination of manpower needs and the organisation of vocational training to meet those needs is probably already known to participants at the Bamako meeting. I.L.O. technical co-operation projects specifically concerned with the chemical industries include those in Israel and the U.A.R. In Israel training has been organised for chemical technicians within the framework of a Special Fund project. The project in the U.A.R. will commence with a preparatory planning mission to determine priority training needs in the chemical industries and advise on subsequent training action.

21. The I.L.O. would be glad to provide assistance on similar lines in connection with the sub-regional development of chemical industries in West Africa, if this were desired by

the countries participating in the scheme and within the limits of available funds.

22. It would appear most useful in this connection for the body which will no doubt be set up, following the Bamako meeting, to undertake the detailed planning and organisation of the sub-regional chemical industries, to include a specialist in manpower and training for such industries. Such a specialist would be able to participate from the beginning in the discussion and preparation of the programme envisaged, dealing particularly with the manpower aspects involved, and in the establishment and implementation of plans and programmes of training for the technical personnel required.