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6 April 1978
English

ASSISTANCE TO THE INK INDUSTRY,
DP/SYR/77/006,
SYRIAN ARAB REPUBLIC .

Terminal report .

Prepared for the Government of the Syrian Arab Republic
by the United Nations Industrial Development Organization,
executing agency for the United Nations Development Programme

Based on the work of Vijay C. Sankholkar,
printing ink expert

12 JUN 1978

United Nations Industrial Development Organisation
Vienna

id. 78-1864

Explanatory notes

The monetary unit in the Syrian Arab Republic is the Syrian pound (LS). In early 1978 its value in relation to the United States dollar was \$1 = LS 3.95.

References to "tons" indicate metric tons.

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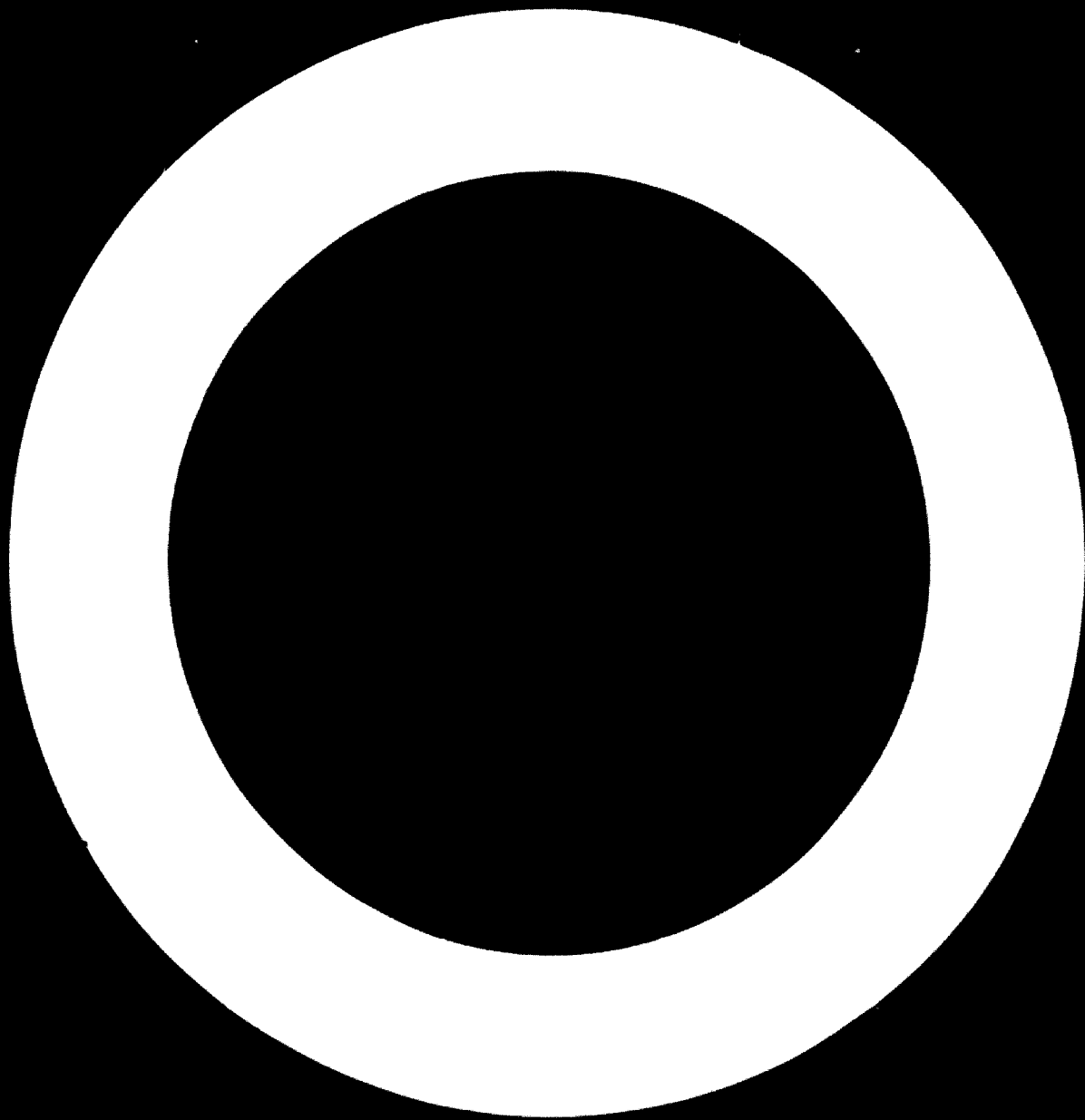
ABSTRACT

The Syrian Arab Republic imports all the printing inks it uses as it has no existing facilities for the manufacture of printing ink. Therefore, the Government requested the assistance of the United Nations Development Programme (UNDP) to establish a printing-ink plant to supply the country's total requirements. Accordingly, an expert in printing ink was sent to the Syrian Arab Republic on the project "Assistance to the ink industry" (DP/SYR/77/006). He arrived on 1 March 1978 and stayed for one month. The United Nations Industrial Development Organization (UNIDO) was the executing agency.

The aims of the project were as follows:

- (a) To carry out a market study of printing inks including local consumption and export potential;
- (b) To inquire into the availability of raw materials for the manufacture of printing inks and to recommend sources of supply;
- (c) To recommend the capacity of the printing-ink plant and the kinds of inks to be produced;
- (d) To estimate capital requirements, costs of production etc.;
- (e) To prepare the list of equipment with specifications for invitations to tender;
- (f) To estimate requirements for plant buildings, utilities etc.

After carrying out the market study, the expert offered alternative recommendations for the project. The first was to establish a printing-ink plant on the premises of the Paints and Chemical Industries Company; the second, to erect a new printing-ink plant. For several reasons, including a clear economic advantage, the expert favoured the first alternative.



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INTRODUCTION

A comprehensive market study of paints, including printing ink, was undertaken by an Egyptian expert, on a private basis, early in 1977, in the Syrian Arab Republic on behalf of the Syrian Paints Company (attached to the General Establishment for Chemical Industries).

The Government, taking into consideration the findings of this study, considered the necessity of establishing an ink producing plant in association with the planned establishment of an integrated printing press. Consequently, a techno-economic committee from the State Planning Commission and the Ministry of Industry was formed. On the basis of the conclusions made by the Egyptian expert and its own preliminary studies, the committee recommended the establishment of an ink industry in the country.

Thereupon, the State Planning Commission requested assistance from the United Nations Development Programme (UNDP) to review the studies already available in this field, assist in the preparation of the tender specifications and the evaluation of offers, and finally, to assess the economic feasibility of the project.

It was decided to start the project with the provision of consultant services in two phases. During the first phase of his assignment to the project, the expert will review the preliminary studies already available, assist in the preparation of tender specifications and prepare the Project Document. During the second phase, the expert will assist in the selection of offers and in the final evaluation of economic feasibility.

Accordingly, an expert in printing ink was sent to the Syrian Arab Republic on the project "Assistance to the ink industry" (DP/SYR/77/006). He arrived on 1 March 1978 and stayed for one month. The United Nations Industrial Development Organization (UNIDO) was the executing agency.

The expert's researches showed that the Syrian average consumption of offset printing inks as against black and coloured offset inks during the past two years has been increasing in a stepwise manner and the percentage has increased by about 14%. As it is planned to start the governmental printing press plant late 1978 or early 1979, and its proposed yearly paper consumption will exceed 6000 tons, the consumption of offset printing inks is more likely to increase than decrease. These findings support the

recommendations made by the techno-economic committee for the establishment of a printing ink manufacturing plant in the country.

After having made a careful study of the situation of the printing ink market, the expert made alternative recommendations.

A printing-ink plant should be started on the premises of the Paints and Chemical Industries Company to produce approximately 200-250 tons per year of offset and other printing inks. This plant would require the following equipment and laboratory instruments for testing:

- 1 agitator ball mill with continuous operation
- 1 Laray viscosimeter with thermostat
- 1 tack-o-scope instrument for measuring tack or stickiness of the ink
- 1 IGT printability testing unit for testing the printing inks

In the initial phase, priority should be given to the production of offset and rotary inks. However, with the same machinery the Government can also produce any amount of inks for other printing processes such as rotogravure or flexography.

The second recommendation was that a printing-ink plant should be started in the vicinity of the proposed Al-Baath Printing Press plant to produce approximately 200-250 tons per year of offset and other printing inks. The list of equipment and laboratory instruments required for this plant is given in annex I.

The capital requirements, costs of production etc. amount to approximately LS 4.3 million for the first alternative and over LS 7.8 million for the second.

I. FINDINGS

Although the expert needed all the relevant information on studies that had been undertaken by the techno-economic committee of the State Planning Commission, the expert's first counterpart (annex II), who was from the Commission, merely referred him to the yearly compilations of foreign trade statistics. Excerpts from these statistics are given in table 1.

Table 1. Inks imported into the Syrian Arab Republic, 1968-1976

Year	Type	Amount (kg)	Cost (LS)	Average price (LS/kg)
1968	Printing	60,957	237,729	3.90
	Other	96,626	141,478	1.50
1969	Printing	97,588	395,146	4.05
	Other	274,325	444,249	1.62
1970	Printing	80,530	375,871	4.70
	Other	168,596	182,718	1.10
1971	Printing	94,513	539,806	5.70
	Other	216,627	499,425	2.30
1972	Printing	92,416	581,227	6.30
	Other	599,418	720,691	1.20
1973	Printing	178,510	382,175	2.15
	Other	18,560	75,771	4.10
1974	Printing	98,270	751,372	7.65
	Other	235,623	547,756	2.33
1975	Printing	208,014	1,160,171	5.60
	Other	114,699	622,785	5.43
1976	Printing	78,201	1,026,863	13.13
	Other	61,875	485,003	7.84

The expert conducted research himself by visiting local printing presses and collecting data on their monthly and yearly requirements for printing inks. Also, the expert's counterpart had sent questionnaires to approximately 200 of the 300 small and 10 large units that operate in the Syrian Arab Republic. Unfortunately, only 28 small and 4 large units replied. The expert studied these data, which are shown in table 2.

Table 2. Annual consumption of printing ink by
28 small and 4 large units

Product	Consumption of 28 small units (kg)		Consumption of 4 large units (kg)	
	1976	1977	1976	1977
Black offset ink	2,815	3,180	585	12,070
Coloured offset ink	5,440	5,870	1,935	2,820
Black rotary ink	6,504	7,169	14,593	8,300
Coloured rotary ink	5,702	6,240	525	550
Oils and additives	2,171	2,606	905	930

Based on the data in table 2, the estimated consumption of ink per year in the case of 300 small and 10 large units should be as shown in table 3.

Table 3. Estimated consumption of printing ink, 1976-1977

Product	Consumption of 300 small units (kg)		Consumption of 10 large units (kg)	
	1976	1977	1976	1977
Black offset ink	30,160	34,070	1,460	30,175
Coloured offset ink	58,285	62,890	4,840	7,050
Black rotary ink	69,685	76,810	36,480	20,750
Coloured rotary ink	61,090	66,850	1,310	1,375
Oils and additives	23,260	27,920	2,260	2,325
Total	242,480	268,540	46,350	61,675

However, the expert's findings revealed a much higher yearly consumption of offset inks, for example, one of the biggest printing presses in Damascus gave its annual consumption of offset inks as approximately 45 tons, which can be taken as average for the 10 large units that operate in the Syrian Arab Republic. Another unit gave their figure as approximately 12 tons per year. This unit is in the process of expansion and a four-colour sheet offset printing machine is being mounted in its plant, which is likely

to raise considerably the consumption of offset inks. On the basis of the estimates drawn up by the committee, the approximate yearly consumption of offset printing inks for the new printing plant should amount to 50-60 tons. The approximate yearly consumption of offset inks (black, blue, red and yellow - European scale) at present amounts to approximately 130 tons. When the Al-Baath printing plant goes into production, this will naturally increase.

There are many companies in Europe who have been supplying raw materials, which must be imported, to the Paints and Chemical Industries Company, c and f Lattakia, and so there will be no difficulty in acquiring the raw materials required for the printing-ink plant. The capacity of the plant can always be increased by increasing the number of shifts. Taking into account the expected yearly consumption of offset printing inks, the expert proposes that the plant should have a one-shift production capacity of 200 tons per year. The required equipment, with specifications, is listed in annex I. Estimates of production costs are given in annexes III and IV and a production flow-chart is shown in annex V. Annex VI gives the estimates for plant buildings, utilities etc.

During the project, the UNDP Resident Representative and the Senior Industrial Development Field Adviser (SIDFA), after a discussion with the expert about his progress, decided to attach the project to the Industrial Research and Development Centre (IRDC), resulting in the appointment of a new counterpart (annex II).

Many visits were undertaken by the expert and Mr. Talo to different printing presses and to the only paint company in Damascus. In two months or so, this company will be receiving the same type of equipment recommended by the expert (annex I) for the printing-ink plant, i.e. one high-speed dissolver, one hydraulic triple roller mill, one laboratory triple roller mill and one laboratory high-speed dissolver. When the expert discussed the possibilities of manufacturing printing inks at the paint company, the Technical Manager welcomed the idea. He said there would be no difficulties in manufacturing about 800-1,000 kg per day of printing ink, according to the formulas prescribed (annex VII), without disturbing the production of paints, and the plant has enough surplus power capacity to operate the additional machinery required. There would be no problem with the water supply to hinder the manufacture of printing inks. The only difficulty would be the lack of technical know-how as the manufacture of printing inks

is a special field and not the job of paint technologists.

The company has a shaded area, measuring over 300 m², where manufacturing units are assembled; a workshop to look after the maintenance of equipment; and a storage area for raw materials and finished products. It also has administrative, marketing and production personnel, and skilled and unskilled labour. For manpower requirements for the plant see annex VIII. The availability of these facilities would save time and money. Economically, this should be the best alternative to the existing recommendation of establishing a printing ink plant in the country. (See annexes IX and X for financial details of the plant.) For this alternative, all that will be required are the laboratory equipment for quality control of the products (annex I, last five items) and a complete unit of agitator ball mill with capacity of approximately 200 kg/h. The price of this agitator ball mill, together with spare parts is not more than LS 50,000. Under these conditions, practically all types of inks could be manufactured, including water-thinnable flexographic inks and writing inks which are, at present, being imported in enormous quantities.

II. RECOMMENDATIONS

The expert suggests two alternatives for the project giving the advantages and disadvantages of each.

Alternative A

A printing-ink plant should be established on the premises of the Paints and Chemical Industries Company.

Technical know-how should be obtained under a 5- or 10-year agreement.

Tenders should be invited for an agitator ball mill with continuous operation (annex I).

Laboratory instruments should be purchased for the quality control of printing inks, as follows:

- (a) A Laray viscosimeter to determine the viscosity of printing inks;
- (b) An IGT printability tester to test the printability of the printing inks, their drying or setting time, the shade-matching, and to determine the machine stability of the printing inks;
- (c) A tack-o-scope to determine the tack of the printing ink its machine or press-stability and to compare the tack measurements of different inks;
- (d) A laboratory thermostat with connections for attachment to the Laray viscosimeter.

This alternative is the most economical and will save expenditure on production costs, capital requirements, plant buildings, utilities, power and extra plant investment of more than LS 3.5 million. This would enable the unit to produce printing inks at low prices that could be sold to the local market at a competitive price leaving the Government a good profit margin.

Alternative B

The printing-ink plant should, if possible, be erected in the vicinity of the proposed Al-Baath Printing Press Plant.

Tenders should be invited for the following equipment:

- (a) High-speed dissolver with variable shaft-speed and hydraulic lift;
- (b) Two stainless steel tanks of a capacity of about 2000 l, with covers to prevent the dust rising while the mixing process is going on and valves at the bottom for emptying the ink;

(c) Hydraulic triple roller mill for the grinding of the printing inks with a working roller length of 1000 mm;

OR

(d) Agitator ball mill with continuous operation supplied with variable feed pump and grinding container of either 15-l or 45-l capacity;

(e) Two balances for weighing the production batches with a maximum loading capacity of about 600 kg;

(f) Laboratory three roll mill with either a mechanical or hydraulic adjustment and having a roller length of 300 mm;

(g) Laboratory high-speed dissolver with variable shaft speed and four Cowles' discs of different diameters;

(h) Laray viscosimeter for determining the viscosities of printing inks;

(i) Thermostat, laboratory-type, to be used in connection with the Laray viscosimeter.

The laboratory testing devices listed below should be purchased.

- (a) Tack-o-scope for measuring the tack of the printing inks;
- (b) IGT-ink printability tester;
- (c) Ericson grindometer for measuring the fineness of the grind.

A shade or building should be erected (annex VI). A generator should be installed for the supply of power in case of a power failure.

Professional, supervisory, skilled and unskilled labour should be selected well in advance of the starting of the plant.

The most important thing is the technical know-how, for which the expert recommends that well-known European printing ink manufacturers be contacted and an agreement made for the acquisition of technical know-how over 5-10 years either by paying a lump sum or royalties.

Advantages and disadvantages of alternatives A and B

<u>I t e m</u>	<u>Alternative A</u>	<u>Alternative B</u>
Training of technical personnel	Personnel are already available and experienced in a related branch.	Personnel will first have to be selected and will then require a longer training period.
Start-up of production	Production can be started much earlier than in the case of Alternative B.	Depending on the construction of buildings etc., it will take at least 6-9 months before production can begin.
Cost of equipment etc.	Not more than LS 80,000	Over LS 1,000,000
Production costs	About LS 1 million	More than LS 3 million
Cost of printing ink in LS/kg	Will be approximately 6 LS/kg.	Will be approximately 18 LS/kg.
Facilities	The facilities available in the paint company would be a tremendous advantage.	No facilities are available.

Annex I

EQUIPMENT, WITH SPECIFICATIONS, FOR INVITATIONS TO TENDER

Complete unit for the mixing and dispersion of offset printing inks consisting of:

- (a) High-speed disperser - shaft speed adjustable by means of variation drive - lifting of the shaft hydraulically;
- (b) Two stainless steel tanks each of 2000 l capacity supplied with a cover to avoid rising of dust during mixing the material and with valves at the bottom for emptying the ready production;
- (c) A set of spare parts for two years.

Hydraulic triple roller mill for grinding printing inks with a working length of roller of 1000 mm and a set of spare parts sufficient for two years.

Laboratory triple roller mill with a mechanical or hydraulic roller adjustment, a working length of roller of 300 mm and an explosion-proof motor.

Laboratory high-speed dissolver with variable shaft speed, supplied with Cowles' discs of diameters 40, 60, 80 and 90 mm and explosion-proof motor.

Complete unit of an agitator ball mill with continuous operation and a grinding container capacity of between 15 and 50 l; a variable-feed pump and an explosion-proof motor.

Balance for weighing the production batches with a maximum load of approximately 600 kg.

Ericson grindometer for testing the fineness of grind.

Laray viscosimeter for measuring the viscosities of inks.

Laboratory thermostat with connecting facilities to the Laray viscosimeter.

Tack-o-scope apparatus for measuring the tack of inks, available from:
Rudolf Meyer's Inc.
152-154 Brouwersgracht
Amsterdam, The Netherlands.

IGT-printability tester, available from:
Institut voor grafische Techniek TNO
Ter Gouwstraat 1, P.O. Box 4150
Amsterdam, The Netherlands.

ANNEX II

COUNTERPARTS

Hassan Masri
Official of the State
Planning Commission

Ghassan Talo
Official at the Industrial Testing
and Research Centre

Annex III

PRODUCTION COSTS FOR 140 TONS OF OFFSET INK

Table 4. Production costs for 140 tons of offset ink^{a/}

Variable costs	Price per ton c and f (LS)	Amount (tons)	Value (LS)	
<u>Raw materials</u>				
Carbon black	7 000	13.20	92 400	
Phthalocyanine blue	35 000	4.32	150 970	
Lithol red	30 000	4.80	141 935	
Benzidine yellow	43 000	4.32	185 806	
Reflex blue	38 000	1.32	49 677	
Extenders	5 000	13.40	67 000	
Varnish	7 000	87.10	585 350	
Wax paste	7 000	5.36	36 022	
Mineral oil	2 000	6.70	13 400	
Driers etc.	13 500	2.00	26 880	
<u>Industrial utilities</u>				
Electricity	0.15/kWh	50 kWh/ton	7000 kWh	1 350
Water	0.05/m ³	-	-	100
Packaging tins (Average: 1, 2 $\frac{1}{2}$, 5kg)	2.00	500 tins /ton	70,000 tins	140 000
Contingency (3%)				<u>44 730</u>
		Subtotal:		1 535 620
<u>Fixed costs</u>				
Salaries and wages:				
Foreign workers (2)		120 000		334 800
Local workers (22)		214 800		
Maintenance materials:				
For equipment		10 000		10 850
For buildings (1/2%)		850		
Insurance and taxes		-		
Interest on working capital				90 130
Technical assistance and know-how				400 000
Depreciation:				
For equipment (10%)		60 000		66 800
For building (4%)		6 800		
Contingencies (10%)				90 258
		Subtotal of fixed costs:		<u>992 838</u>
		Total		<u>2 528 458</u>

^{a/} Approximately 70 tons of black ink, and 70 tons of blue, red and yellow ink (equal amounts).

Annex IV

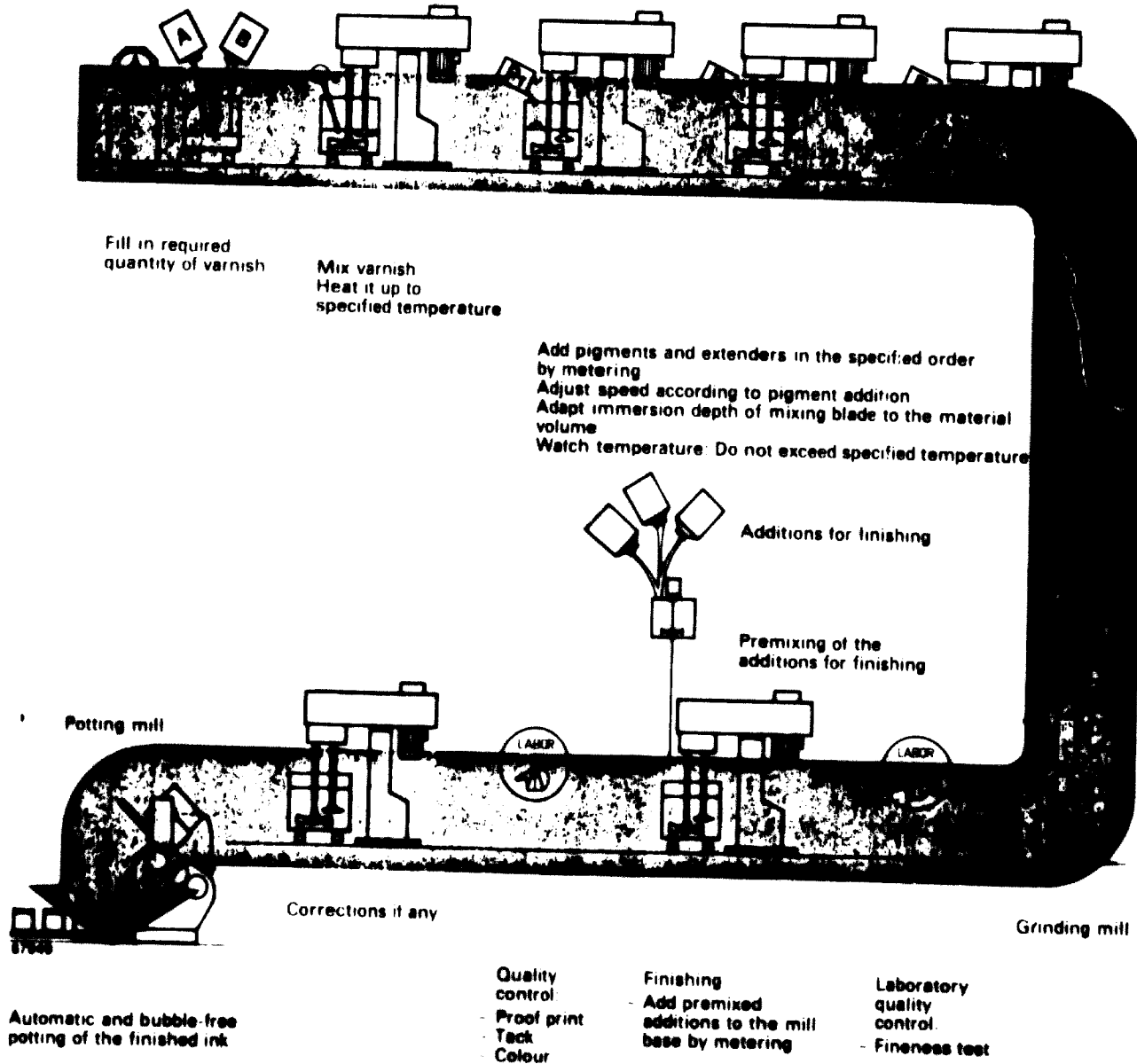
ANNUAL PRODUCTION COSTS

Table 5. Annual production costs (LS)

<u>I t e m</u>	1979 (70%)	1980 (80%)	1981 (85%)	1982 (90%)	1983 (95%)	1984 (100%)
<u>Fixed costs</u>	992 838	992 838	992 838	992 838	992 838	992 838
Salaries	334 800					
Maintenance	10 850					
Interest on working capital	90 130					
Know-how	400 000					
Depreciation	66 800					
Other (10%)	90 258					
<u>Variable costs</u>	1 535 620	1 754 994	1 864 681	1 974 368	2 084 056	2 193 743
Total production costs	2 528 458	2 747 832	2 857 519	2 967 206	3 076 894	3 186 581
Price per kilogram	18.06	17.20	16.80	16.50	16.20	15.90

Annex V

FLOW CHART OF THE PRODUCTION OF OFFSET AND LETTERPRESS INKS



Annex VI

REQUIREMENTS FOR PLANT BUILDINGS, UTILITIES ETC.

Area required for:	<u>m²</u>
Equipment etc.	300
Raw materials	500
Finished products	380
Laboratory	120
Administrative offices	150
Lavatories, baths etc.	<u>250</u>
Total	1 700
Estimated cost of building	1 000 LS/m ²
Total cost of building requirements	LS 1,700,000

Annex VII

STANDARD FORMULAS FOR OFFSET INKS

Table 6. Standard formulas for offset inks (European scale)

Composition	Ink			
	Black	Blue	Red	Yellow
		Approximate percentage		
Carbon black	18-20	-	-	-
Phthalocyanine blue	-	16-18	-	-
Lithol red	-	-	18-20	-
Benzidine	-	-	-	18-20
Reflex blue	2	-	-	-
Extenders	5-10	5-10	5-10	5-10
Varnish	60-65	65-70	65	65
Wax paste	3-4	3-4	3-4	3-4
Mineral oils	4-5	4-5	4-5	4-5
Driers solution	1-2	1-2	1-2	1-2
Total	100	100	100	100

Annex VIII

MANPOWER REQUIREMENTS

Table 7. Estimated annual salaries at full capacity

Department	Local				Foreign	
	Professional ^a Number	Supervisory ^b Number	Skilled ^c Number	Unskilled Number	Total Number	Professional ^a Number
	LS	LS	LS	LS	LS	LS
Administration	1	1	1	4	7	
	18 000	12 000	9 600	24 000	63 600	
Production	1	2	5	2	10	2
	18 000	24 000	48 000	12 000	102 000	120 000
Marketing		1	1	1	3	
		12 000	9 600	6 000	27 600	
Maintenance		1	1	2	2	
		12 000	9 600	21 600	21 600	
Total	2	5	8	7	22	2
	36 000	60 000	76 800	42 000	214 800	120 000

a/ Degree plus several years experience.

b/ Degree or equivalent experience.

c/ Either theoretical or on-the-job training.

Annex IX

ESTIMATED CAPACITY OF PRINTING-INK PLANT AND ANNUAL INCOME

Table 8. Estimated capacity of printing-ink plant

Year	Percentage	Capacity		
		Tons		
		Black	Coloured	Total
1979	70	70	70	140
1980	80	80	80	160
1981	85	85	85	170
1982	90	90	90	180
1983	95	95	95	190
1984	100	100	100	200

Table 9. Estimated annual income
(Thousands of LS)

Product	Sales ^{a/}					
	1979	1980	1981	1982	1983	1984
Offset ink						
Black (24 LS/kg)	1 680	1 920	2 040	2 160	2 230	2 400
Blue (40 LS/kg)	933.3	1 066.6	1 133.3	1 200	1 266.6	1 333.3
Red (40 LS/kg)	933.3	1 066.6	1 133.3	1 200	1 266.6	1 333.3
Yellow (42 LS/kg)	980	1 120	1 190	1 260	1 330	1 400
Total	4 526.6	5 173.2	5 496.6	5,820	6,143.2	6,466.6

^{a/} Ex-factory, price which should include sales and excise taxes provided they are also included in operating expenses.

Annex X

PLANT INVESTMENT AND START-UP COSTS

Table 10. Plant investment and start-up costs (thousands of LS)

Item	Year 1 (1978/79)
<u>Fixed assets</u>	2,913.8
Equipment costs and c.i.f./ex-factory costs	1,001.5
Transport to site	1.5
Installation	6.0
Land acquisition development and buildings	1,700.0
Furniture	20.0
Other fixed assets (transportation etc.)	100.0
Contingencies on fixed assets (3%)	84.8
<u>Preliminary expenses</u>	1,390.4
Licenses, royalties and technical assistance	400.0
Planning and other consultancy services	100.0
Initial advertising	100.0
Start-up expenses	724.2
Contingencies on preliminary expenses (5%)	66.2
<u>Working capital</u>	1,004.1
Working capital	912.8
Contingencies on working capital (10%)	91.3
Total	5,308.3

C-13



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