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ADVISORY ASSISTANCE FOR THE
ESTABLISHMENT OF A FORMALDEHYDE BASED
RESIN FACILITY

THE REPUBLIC OF TRINIDAD & TOBAGO
US/TRI/89/172

FINAL REPORT*

Prepared for the Government of Trinidad & Tobago
by the United Nations Industrial Development Organization

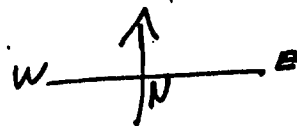
Based on the work of Boris Cunradi, PhD, Unido Consultant

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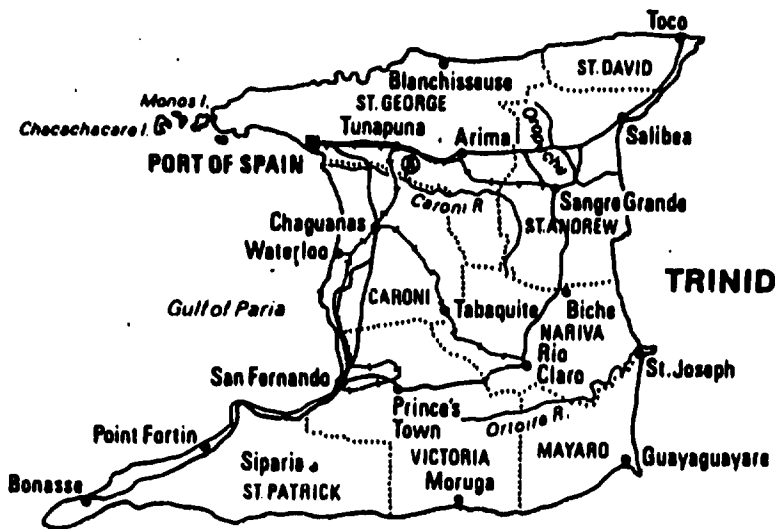
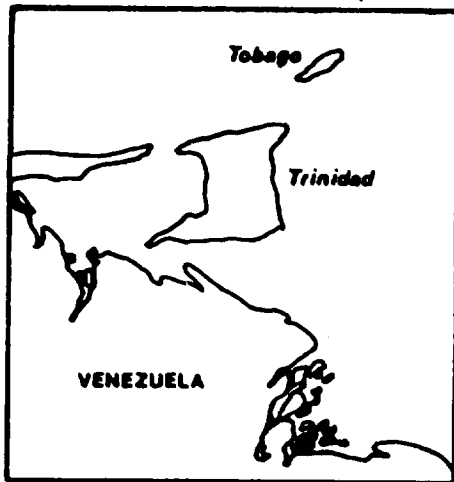
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Trinidad and Tobago



CARIBBEAN SEA

	Main roads
	Main railways
	Internal boundaries
	Main airports



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BACKGROUND OF THE PROJECT

Trinidad and Tobago's economy was for a long period based on agricultural products but was transformed by the discovery of oil. The petroleum industry is still a major contributor to GDP although its share fell drastically because of falling oil prices. In the 1980's diversification of the economy was priority. The significant reserves of natural gas are providing the basis for new industrial development, especially petrochemicals among which formaldehyde. The production of gas increased to 7,586 million m³ in 1986.

The two state owned oil companies Trintopec and Trintoc started work on a gas production platform off the south-east coast of Trinidad, aimed at 1.75 million m³ per day in January 1990. It should provide enough gas to fuel the existing methanol and ammonia factories. Methanol is the main raw material for formaldehyde. According to T&T Government wishes, the production of formaldehyde would fit in the plan for the Point Lisas industrial estate development and would stimulate the production of methanol as well as facilitate many other chemical sectors. In line with this policy, July 1987 Trintoc started production of urea formaldehyde concentrate 85%. The available outlet for 5000 of the 12,000 tons name plate production capacity of the new facility was the already existing urea plant, needing UFC 85 for coating the granules of their slow release urea fertilizers.

Unfortunately no other application was available in the area and the very short shelf life of UFC 85, as well as the endemic surplus on the international market gave no opportunity to Trintoc for the full capacity exploitation of the new plant.

In spite of this situation the Government is looking to different formaldehyde based resins, with priority for melamine-formaldehyde (MF).

The Technical Cooperation Unit (TCU) of the Office of the Prime Minister approached the local UNDP/UNIDO representatives in order to investigate on the availability from UNIDO's side of technical advisory and assistance.

During April 1990, Mr. Eelco Galama of UNIDO-Vienna visited Trinidad & Tobago.

At the Technical Co-operation Unit (TCU) a meeting was held with the representatives of the TCU, NIHERST, CARIRI and the Ministry of Planning and Mobilization. The Government decided that the counterpart for the formaldehyde based resin facility would be CARIRI on behalf of the Ministry of Planning and Mobilization. As requested by the Government a copy of the revised project document dated end November 1989 was handed over by UNDP as well as 4 CVs of experts of whom the Government has to make a selection. At the meeting it was mentioned that the Inter-American Development Bank might be willing to finance a feasibility study. CARIRI has formed a counterpart team including a chemical engineer and an economist.

The Government selected the expert proposed by Baldo & C of Milan (Italy). Mr. Boris Cunradi, PhD for a consultancy duration of 2.5 months.

The request, according to Mr. K. Mitsui UNIDO's JPO in Trinidad, was for an urgent intervention because the integrated plastic production is a high priority for T&T Government. As a matter of fact they are ready to undertake a full-fledged feasibility study if the preliminary UNIDO expert's investigation brings favourable results. The finance for the feasibility study would come from the Inter-American Development Bank

The selected consultant started his mission on 20th November 1990.

II SCOPE OF WORK

The aim of this study is to enable the Government of Trinidad and Tobago to decide on the undertaking of a full-fledged feasibility study for the establishment of a facility for the production of formaldehyde based resins.

For this purpose it was necessary:

1. to define the exact product(s) and eventual by-product(s), quality specification and describe for which purpose they can be used; define products; life cycle;
2. to ascertain the users of formaldehyde based resins, the present and future local demand and present and future foreign demand in the light of the world trend of supply/demand; assess the market penetration; analyse growth rate trends; assess and describe the market areas;

3. to ascertain whether this demand, domestic and export, can sustain a reasonable production programme; new existing plants in Trinidad and Tobago, recent additions to capacity, closures within last 5 years and reasons of their closure will be investigated;
4. to indicate if the case the various technological options for satisfying the above market and country's inherent specific competitive advantages and constraints;
5. to ascertain current policies and strategies of the Government and international factors which might affect the production and sales for local and export market; define also the required Government measures needed for the promotion of the project;
6. to ascertain the availability of the required raw materials in terms of quantity and quality and their prices; determine whether the inputs including packaging materials are locally available or have to be imported; describe factors affecting supply and demand of raw materials; describe factors affecting the use of formaldehyde as an intermediate product;
7. to define market opportunities, market development and market strategies for selling formaldehyde based resins, propose possible alternative sales and marketing programmes, select sales programme and strategy and state for selection; estimate sales revenues based on sales programme and marketing strategy; describe eventual after-sales requirements;
8. to work-out a project document with terms of reference on the preparation of a feasibility study for one or more resins production units.

III METHODOLOGY

The study has been developed according to the following methodology:

- Desk research on current trend on the supply/demand ratio worldwide, in the Gulf area, in the Caricom area and specifically in Trinidad & Tobago.
- Interviews to some leading European producers of urea formaldehyde concentrate (from now on called UFC 85) in order to state definitely the present phase of product's life and its future.

- Interviews to some major petrochemical traders in Houston to ascertain the overall market request and price trends in the area of Gulf and Caribbean countries.
- Visits to up and down-stream industry in Trinidad.
- Visits to potential utilizers in Guyana and Jamaica.
- Study of price trends for formaldehyde based resins and price trend forecast through contacts with Americal and European producers.
- Cross-checking of gathered data and interpretation of the results.

THE TRINIDAD AND TOBAGO MARKET

FOR FORMALDEHYDE BASED RESINS

3.

CONCLUSIONS AND RECOMMENDATIONS

0.1

INTERNATIONAL MARKET

Formaldehyde based resins represent the first generation of thermosetting resins.

Presently, in the area of molding compounds they face the strong competition not only of more updated thermosetting resins as polyurethanes, unsaturated polyesters etc., but also of some thermoplastics.

The competition of other thermosetting resins is based on better physical and chemical properties whether on the other hand thermoplastics consent cost reductions on processing/converting operations.

The application for formaldehydic glues which represent their major outlet is under trial because of some formaldehyde release from the final products as well as because of some environmental problems arising during the production. As a matter of fact, formaldehyde has been included by OMS in the list of health hazardous products.

Under these circumstances, the market of formaldehydic resins is slowing down: for some outlets (for instance textile finishing) definitely dropped.

Formaldehyde based resins keep anyway their positions within the following areas:

- | | |
|-------------------------------|--|
| UREA FORMALDEHYDE: | - Binders for wooden chip and fibre boards and panels. |
| | - Glues for regular type of plywood |
| | - Electrical fittings. |
| PHENOL FORMALDEHYDE: | - Binders for water resistant chip and fibre boards |
| | - Glues for marine plywood |
| | - Car fittings |
| | - Impregnants for Phenol/melamine laminates. |
| MELAMINE FORMALDEHYDE: | - Phenol/melamine laminates and sheets |
| | - Fire resistant small household items |

In any case formaldehyde based resins has to be considered as mature products and for some important end-uses as moulding compounds on the way of obsolescence.

No additional capacity has been installed during the last decade by the leading producers. On the other hand a number of units has been put on stand-by or shot-down.

The average rate of utilization is low respectively, 68% for Urea Formaldehyde, 62% for Melamine Formaldehyde and 57% for Phenol Formaldehyde; there is no reason to expect a general improvement of the situation. The only area which we consider safe for the time being is plywood glues and chipboards binders production (generally integrated by-side to the plywood and chipboards units).

The impossibility of replacing glues with other products at comparably low price makes them still interesting. On the other hand, according to E1 standards, generally accepted by the industrialized countries (West-Europe and North America), a formaldehyde release of 0,10 ppm is not considered health hazardous.

0.2 REGIONAL MARKET

The CARICOM market is very small and no more than 6-700 tons of formaldehydic resins are imported.

Trinidad and Tobago enjoy anyway of a very peculiar situation which consist of a market niche represented by:

- A) The existing urea plant needing 5,000 tons/year UFC 85 for coating their slow release urea fertilizer.
- B) The new 100,000 CU MT. plywood plant requiring 5000-5500 tons/year UFC 85 as intermediate for their glues integrated line; competition from overseas is practically stopped by transport problems related to the very short shelf-life (2-3 months max) of UF.
- C) The foreseen expansion of Trinidad's urea fertilizers (Norskhydro) meaning a demand for further 5,000 tons UFC 85 by 1995-96. The demand could be met only by expanding local UFC capacities.
- D) The revamping of the former bagasse board plant, going to use wooden wastes from the plywood factory able to utilize some thousands tons resins. It will be a further good reason for expanding UFC capacities.

E) A melamine sheets demand inducted starting from chipboards production, for finishing.

The table which follows shows the forecast of supply/demand during the period 1990-2000.

TRINIDAD & TOBAGO - UF YEARLY SURPLUS/DEFICIT 1990/2000 (METRIC TONS)

YEAR	CAPACITY	EXPLOITATION RATE %	PRODUCTION	IMPORTS	CONSUMPTION	AVAILABILITY
1990	12,000	42	5,000	100	5,100	+5,400
1991(*)	12,000	54	6,500	100	6,600	+3,900
1992	12,000	88	10,500	100	10,600	-100
1995(**)	12,000	88	10,500	2,100	12,600	-2,100
2000(***)	12,000	88	10,500	7,100	17,600	-7,100

(*) Impact of a probable long term contract between Trintoc and Caribbean Plywood for the supply of UFC 85, starting August 1991. In 1992 the plywood factory is supposed to work at full capacity.

(**) It is reasonable to believe that the revamped "Bagasse plant" will need for their chipboard approx. 2,000 tons/year UFC.

(***) The Norskhydro urea plant could be fully operational by 2000 and need therefore some 5,000 tons/year UFC.

To 1992 the present over capacity of Trintoc is sufficient to fulfil the demand for the plywood plant. If a chipboard facility is also starting its operation in 1992, or when the bagasse plant is rehabilitated or annexed to the plywood plant, the additional production capacity of around 2,000 tons has to be made available in Trinidad by expansion of the Trintoc plant or, alternatively 2,000 tons should be imported.

When the plans of Norskhydro for increasing the production of ammonia fertilizers will materialize, additional production capacity in Trinidad will be necessary as from 1995. In that case a full fledged feasibility study for expansion of Trintoc's plant is recommended.

In case of Bagasse plant revamped, a melamine formaldehyde resin unit and an integrated sheeting line, in order to supply finishing material to the chipboard factory, could also be taken into consideration.

1. **OUTLINES**

1.1 **THE CARIBBEAN REGION AND TRINIDAD & TOBAGO**

1.1.1 **Political Background**

The Federation of the West Indies, comprising ten dependencies and set up in 1958, broke up in 1962 with the secession of Jamaica and Trinidad, both of which became independent states during that year. The remaining colonies, with Barbados and the Windward & Leeward Islands, attempted to form a new federation, but Antigua refused to participate in the discussions on a draft scheme and Barbados thereupon opted for separate independence. In 1967 a new constitutional arrangements, associated status with the UK, came into force for Antigua & Barbuda, St. Kitts-Nevis, and the Windward Islands (with the exception of St. Vincent, which gained associated status in October 1969).

Most territories became independent between 1966 and 1983. The remaining dependencies are Antigua, the British Virgin Islands, the Cayman Islands, Montserrat and the Turks & Caicos Islands. A free trade area agreement between Antigua, Barbados and Guyana came into force in April 1967 and was extended to include Trinidad & Tobago in May 1968. Jamaica and the associated states, which had held back from joining the new association - the Caribbean Free Trade Area (Carifta) - formally entered in July 1968; Belize joined in 1971.

The four countries then independent - Jamaica, Trinidad & Tobago, Guyana and Barbados - formed a Caribbean Common Market (Caricom) in August 1973; all but one (St. Kitts-Nevis) of the Windwards & Leewards joined in the following year. St. Kitts-Nevis, Belize and the Bahamas subsequently became members.

Caricom came under great strain in 1983 and thereafter, as a result of devaluations and import restrictions by member states, which led to a substantial decline in intra-regional trade. The invasion of Grenada in October 1983 deepened political divisions.

From 1987 onwards, a greater spirit of cooperation was evident, and a revival of intra-regional trade began. The annual heads of government meeting in July 1989 adopted a series of measures aimed at greater economic and political integration.

The Caribbean Development Bank (CDB) was set up in 1969 as the first regional lending agency. Its members include Mexico, Venezuela, Colombia, France, Italy, Canada and the UK, as well as the 17 English speaking Caribbean countries. At the end of 1988 the CDB had total capital resources of US\$ 733.2 mn; cumulative loan approvals amounted to US\$ 655.2 mn.

1.1.2 International relations

President Reagan's Caribbean Basin Initiative (CBI) came into effect on January 1, 1984. The beneficiaries are Antigua & Barbuda, the Bahamas, Barbados, Belize, British Virgin Islands, Dominica, Dominican Republic, Grenada, Guyana, Haiti, Jamaica, Montserrat, Netherlands, Antilles, St. Kitts-Nevis, St. Lucia, St. Vincent & the Grenadines and Trinidad & Tobago, as well as all the Central American countries except Nicaragua.

The CBI provides for duty free access to the US market over a period of twelve years for all products except textiles and clothing, footwear, handbags, luggage, leather apparel, work gloves, canned tuna, petroleum and petroleum products, watches and watch parts. Sugar remains subject to quota limits. To qualify the goods must be exported directly to the USA and a minimum of 35 per cent of their value must be locally added (through 15 per cent of this may be of US origin). The CBI also allows for tax exemptions for businessmen attending conventions in beneficiary countries; it is being supported by a US\$ 350 mn aid programme approved by the US Congress in 1982.

In its final form the CBI was not as generous as had been hoped; the exclusions from the list meant that since almost 80 per cent of the region's exports already enjoyed duty free access to the USA under the Generalised System of Preferences, the new scheme would in fact only increase the list by 15 per cent. Moreover, a proposed 10 per cent tax credit on new investments was not included in the final document. Since 1985 regional governments have expressed anxiety about the scheme's inadequacies, which have been compounded by growing protectionist trends in the USA; legislation to extend the life of the CBI and broaden its scope was being considered by Congress in 1989.

In February 1986 President Reagan announced a new scheme to permit increased access levels for garment exports from the Caribbean to the USA. The scheme, which is not part of the CBI, allows garments made from cloth woven and cut in the USA to enjoy guaranteed minimum access levels, although not on a completely duty free basis. In 1985 the 21 CBI beneficiary countries supplied 6 per cent of US garment imports, earning US\$590 mn, of which about US\$100 mn went to Caricom countries.

Mr Reagan also announced his support for a proposal, made during 1985 by Governor Rafael Hernandez Colon of Puerto Rico, to use US\$700 mn of government development funds for investment under the Caribbean Basin Initiative. The plan involves the creation of twin plant manufacturing ventures, in which Caribbean countries would supply low cost labour for the assembly of items manufactured in Puerto Rico and the USA. By mid-1989, however, only a few projects had been launched under the scheme.

In 1986 the Canadian government announced details of a scheme similar to the CBI, named Caribbean, which increased the range of goods eligible for duty free entry, but still excluded key items such as textiles, clothing, footwear, luggage and other leather goods, lubricating oils and methanol.

1.1.3

Trinidad & Tobago

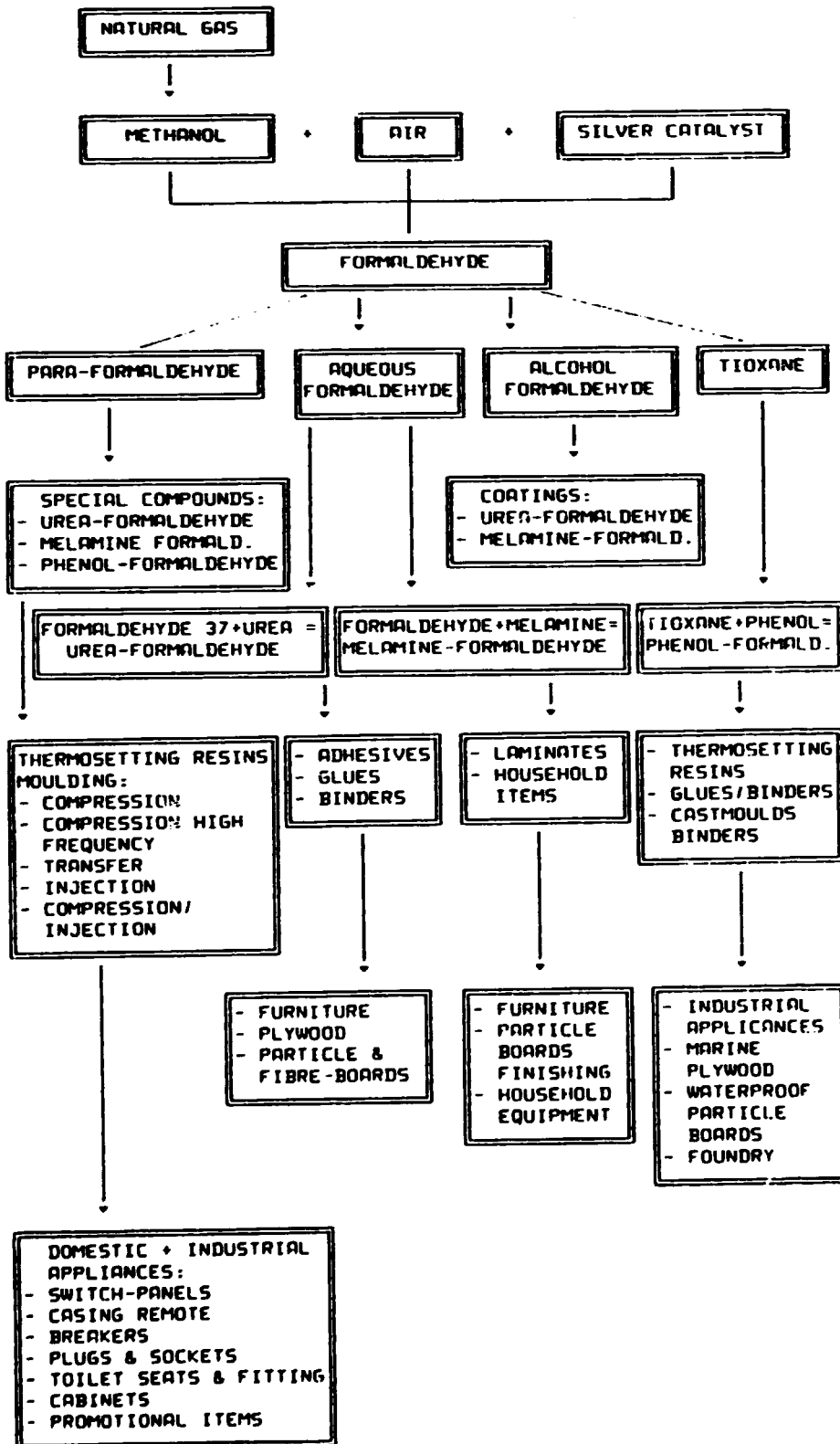
Trinidad & Tobago gained full independence within the Commonwealth on August 31, 1962. In February 1967 it became the first Commonwealth member of the OAS. In August 1976 the country became a republic, with a constitution providing for a House of Representatives of 36 members and a Senate of 31 members appointed by the president; 16 on the advice of the prime minister, six on the advice of the opposition leader and nine at his own discretion.

For details on the political and economical situation of T&T see annexe 1.

FORMALDEHYDE

Table 1 is showing the flow-sheet.

TABLE 1 - PRODUCTION FLOW-SHEET
 METHANOL --> FORMALDEHYDE --> RESINS



Formaldehyde (CH_2O) is usually produced from methanol. In the pure state it is a colourless, pungent smelling, reactive gas.

More than 75% of the producers in Western Europe, U.S.A. and Japan use the oxidation-dehydrogenation process, which reacts methanol with air over a metallic silver catalyst bed.

Commercially the product is known in different forms:

- paraformaldehyde, solid
- formaldehyde, aqueous solution
- formaldehyde, metanol solution
- trioxane

1.2.1 Para-formaldehyde

Para-formaldehyde is an unstable polymer which regenerates easily gaseous formaldehyde when heated. It is produced in form of powder (95% formaldehyde) or of flakes (91% formaldehyde). It is used as intermediate for UF, MF and as resins when a low water content needed as for instance in special plastic compounds.

For general purposes formaldehyde solutions are preferred, as less expensive.

1.2.2 Aqueous formaldehyde

Solutions are supplied with various concentrations, mainly 37% but also 44-50-60%. The solutions are unstable and then polymerize quite easily at atmospheric temperature. By adding methanol to the solution temperatures higher than 32 degrees C can be afforded without polymerization. Formaldehyde is commercially produced as a 37% aqueous solution and primarily used as a feedstock for urea-formaldehyde resins as well as for phenol formaldehyde and melamine formaldehyde resins. Formaldehyde based resins represent the first generation of synthetic resins, being urea-formaldehyde produced since 1930. As a matter of fact, formaldehyde based resins reached already the phase of maturity of their product life and if compared to other thermosetting resins, shows also some obsolescence in the applications as molding compounds.

1.2.3 Formaldehyde alcoholic solutions

Methanol, N-Butanol or Iso-butanol can be used for solutions used for special purposes as modified UF and MF resins (coatings).

1.2.4 Trioxane

Trioxane is a crystalline solid obtained from distillation of aqueous formaldehyde in the presence of a sulphuric catalyst. It is used as intermediate for polyacetalic resins and of phenolic resins (PF).

1.3 RESINS

1.3.1 Urea formaldehyde resins (UF)

These resins are used when a quick setting adhesive is needed; their main outlet consists of the wood processing industry (plywood, chipboard, fibreboard and blockboard).

Within this area they are strongly keeping their positions as binders and glues due to a comparatively low price.

1.3.2 Melamine-formaldehyde resins (MF)

The most important outlet for MF resins consists of laminated simple or multiple sheets (Formica). In the area of laminated sheets melamine formaldehyde (as well as phenol-formaldehyde) is of primary importance, but its position is jeopardized by a generalized and constant negative trend of the market for laminates.

As a matter of fact, the laminated sheets market is suffering since at least 15 years of the competition of alternative, traditional materials, as stainless steel and copper, marble and granite, timber, ceramics considered more fashionable not only in the developed countries market. Consequently the demand for laminates is confined to cheap household and office furniture as well as to contract furniture (hospitals, laboratories, etc.). The utilization of melamine for molding compounds is declining due to the competition of other more suitable thermosetting as well as thermoplastic resins.

Phenol-formaldehyde based resins (PF)

PF resin is the only formaldehyde based resin which is already consistently used in moulding compounds, due to PF resins suitability for electronic and electrical appliances. The other major applications are laminated sheets, marine plywood and water resistant chipboards.

PF resins are also specifically used as binders for castmoulds in the foundries, mainly of non-ferrous metals.

TABLE 2

FORMALDEHYDE BASED RESINS
WORLDWIDE MAJOR OUTLETS
(QUANTITY AND % ON TOTALS)

1989/90

APPLICATIONS (OUTLETS)	RESINS (TONS X 10 ³)					
	Qty	UF %	Qty	MF %	Qty	PF %
- Plywood & fibre/chipboards	2685	73	--	--	755	40
- Laminates & moulding compounds	220	6	350	65	340	18*
- Paper & paperboards, ink.	184	5	--	--	227	12
- Coatings	184	5	162	30	227	12**
- Foundry shell moulds	--	--	--	--	132	7
- Miscellaneous	405	11	27	5	207	11
TOTAL	3678	100	539	100	1888	100

* Electronics & electrical appliances 12 percent approx

** Insulation

1.4 OTHER SYNTHETIC RESINS

Synthetic resins are classified into two main categories, thermoplastic and thermosetting resins.

The major thermoplastic resins are:

- polyethylene
- polypropylene
- polystyrene
- polyacrylics
- polyamides
- saturated polyester
- acetal homopolymers

The major thermosetting resins (formaldehyde resins excluded) are:

- polyuretans
- unsaturated polyester
- polyvinilic acetate (PVC)
- polyacrylonitril butadienestyrene (ABS)
- styroacrylnitrate (2) SAN
- polymethylmetacrilate

Downstream converting technologies in many cases can be less expensive for thermoplastic than for thermosetting resins so that there is a strong intercompetition in the areas where the two families of resins can replace each other.

The sole application where formaldehyde based resins are not facing any competition are plywood and chipboard, glues & binders, because of their low price.

1.5 GUIDELINES FOR CLASSIFICATION OF MANUFACTURED GOODS ACCORDING TO THEIR FORMALDEHYDE EMISSIONS

For the time being no official international rule exists for determination of tollerancies of formaldehyde emissions from goods produced by using formaldehyde based resins.

Generally emissions lower or equal to 1 ppm are tollerated.

This unwritten agreement is based on a guideline issued by the West-German authority April 1980 and confirmed by the text of the Bundesrat Act of 16.10.1986 and further modified October 1986.

The same limits have been applied in 1988 for plywood and in 1989 for furniture. The German legislation is considered the strictest within the industrialized countries and therefore has been accepted by the utilizers of formaldehydic resins as a parameter.

Manufactured goods has been classified according to formaldehyde emissions in the following table.

TABLE 3
FORMALDEHYDE EMISSION CLASSES

Emission Class	Emission value (PPM HCHO)	Value per 100 gs of man. product of HCHO extracted by perforation tests	Performance
E1	≤ 0.1	≤ 10	Good
E2	from >0.1 to 1.0	from >10 to 30	Acceptable
E3	from >1.0 to 2.3	from >30 to 60	Unacceptable

Source : C.A.T.A.S. - Regional Centre for Technical Assistance to Wood Manufacturers

As a matter of fact formaldehyde is listed within health-hazardous products and is under trial as cancerogenic product. At this stage there is no statement on this matter but it is reasonable to expect that in the long term severe limits will be introduced for formaldehyde based resins.

State authorities are anyway very cautious in making any decision which could affect the market of particle boards and plywood which represent a major issue in construction and furnishing industry.

In other terms alternative resins could be used but their present costs are in the range of 300-400 percent higher.

2. THE MARKET OF FORMALDEHYDE BASED RESINS

2.1 INTERNATIONAL MARKET

The market of formaldehyde resins is characterized by a steady trend all over the last 10 years. As already mentioned UF, MF and PF resins represent the old generation of thermosetting resins and they can be considered as in the phase of maturity.

As a matter of fact, some major traditional producers shut down or put on stand-by some production units and others went out of the business: practically no expansion of existing capacities is foreseen up/to the end of the century.

The average rate of exploitation of the installed capacities is extremely low: a part of the competition from more advanced thermosetting resins as polyesters and polyurethans, formaldehyde based resins suffer in many applications of the presence of the less expensive thermoplastics which are suitable for many typical uses of thermosetting resins.

The following tables show the supply/demand ratio of formaldehyde and formaldehyde based resins at present. Data are related to 1988 but according to information obtained from some major producers in West Europe and USA the situation did not change substantially during 1989 and 1990.

An other issue is to take into serious consideration when reading the tables: the international trade both of formaldehyde and of all formaldehyde based resins is extremely low, as a matter of fact the very short shelf life of formaldehyde (2 months if liquid, no more than 6 months if spray dried) and of the resins (approx. 3 months at normal temperature) dissuades from long distance transportation.

TABLE 4
FORMALDEHYDE BASED RESINS
EXPLOITATION RATES OF INSTALLED CAPACITIES (%)

1989/1990

AREA	PRODUCTS			
	FORM 37	UF RESINS	MF RESINS	PF RESINS
EEC	71	91	57	70
WEST EUROPE (non EEC)	61	66	58	57
EAST EUROPE	74	N.A.	N.A.	16
NORTH AMERICA	63	62	76	59
LATIN AMERICA	45	45	46	44
OCEANIA	66	59	55	62
ASIA	75	57	53	73
MIDDLE EAST	59	-	60	100
AFRICA	91	58	40	31
WORLD TOTAL	69	68	62	57

TABLE 5 : FORMALDEHYDE 378
SUPPLY/DEMAND 1988

(TONS X 10³)

REGION/COUNTRY	CAPACITY	PRODUCTION	IMPORTS	EXPORTS	ACTUAL CONSUMPT.	PRODUCTION ----- CAPACITY %
E.E.C						
Benelux	270.0	156.0	64.0	24.0	270.0	58
Denmark	70.0	41.0	8.0	.3	49.0	59
France	372.0	313.0	22.0	8.0	327.0	84
Germany, West	2417.0	1848.0	30.0	81.0	1797.0	76
Greece	22.0	15.0	2.0	.0	17.0	68
Ireland	.0	.0	1.0	.0	1.0	-
Italy	1025.0	688.0	2.1	4.8	686.0	67
Portugal	115.0	100.0	.0	.0	96.4	87
Spain	303.0	160.0	1.4	4.5	300.0	53
United Kingdom (UK)	326.0	186.0	2.0	8.0	320.0	57
SUB-TOTAL	4920.0	3477.0	132.5	130.6		71
WESTERN EUROPE (NON-EEC)						
Austria	246.0	175.0	1.0	11.0	181.0	71
Finland	168.0	95.0	.4	.0	96.0	57
Norway	185.0	89.0	.0	.0	89.0	48
Sweden	335.0	226.0	.1	4.0	222.0	67
Switzerland	40.0	30.0	10.0	.0	40.0	75
Turkey	154.0	78.0	.0	.0	78.0	51
SUB-TOTAL	1128.0	693.0	11.5	15.0		61
EASTERN EUROPE						
Bulgaria	30.0	.0	.0	.0	.0	-
Czechoslovakia	277.0	84.0	.0	.0	84.0	30
Hungary	27.0	9.0	12.0	.0	21.0	33
Poland	150.0	98.0	.0	.0	98.0	65
USSR	2080.0	1877.0	.0	5.0	1872.0	90
Yugoslavia	336.0	85.0	.0	.0	85.0	25
SUB-TOTAL	2900.0	2153.0	12.0	5.0		74
NORTH AMERICA						
Canada	433.5	332.0	3.0	16.0	307.5	77
Mexico	199.0	104.0	.3	.0	104.0	52
United States	4923.0	3052.0	13.0	9.0	3056.0	62
SUB-TOTAL	5555.5	3488.0	16.3	25.0		63
LATIN AMERICA						
Andean Countries	103.0	42.0	2.0	.0	44.0	41
Argentina	101.0	31.3	.0	.0	31.3	31
Brazil	351.0	213.8	3.1	.0	243.1	61
Chile	48.0	43.5	.0	.0	45.0	90
SUB-TOTAL	603.0	330.6	5.1	.0		55

TABLE 5: FORMALDEYDE 378
SUPPLY/DEMAND 1988

(TONS X 10³)

REGION COUNTRY	CAPACITY	PRODUCTION	IMPORTS	EXPORTS	ACTUAL CONSUMPT.	PRODUCTION ----- CAPACITY
OCEANIA						
Australia	142.0	91.4	4.0	.0	95.4	64
New Zealand	62.0	44.2	.0	.0	44.2	71
SUB-TOTAL	204.0	135.6	4.0	.0		66
ASIA						
Asia, Southeast	982.0	686.0	.0	.0	686.0	70
China	600.0	475.0	.0	.0	475.0	79
India	184.0	65.0	.0	.0	65.0	35
Japan	1766.0	1361.0	.0	.0	1361.0	77
Korea, South	257.0	251.0	.0	.0	251.0	98
Taiwan	305.0	235.0	3.0	5.0	230.0	77
SUB-TOTAL	4094.0	3073.0	3.0	5.0		75
MIDDLE EAST						
Iran	.0	.0	6.5	.0	6.5	-
Israel	56.0	33.0	.0	.0	33.0	59
Saudi Arabia	.0	.0	1.6	.0	1.6	-
SUB-TOTAL	56.0	33.0	8.1	.0		59
AFRICA						
Algeria	16.5	10.5	.0	.0	10.5	64
South Africa	100.0	95.0	15.5	.0	110.5	95
SUB-TOTAL	116.5	105.5	15.5	.0		91
WORLD TOTAL	19577.0	13488.7	208.0	180.6	13516.1	69

Sources: S R I

CMAI - HOUSTON

SIRLITE - MILAN

DEUTSCHE BAKELITE - FRANKFURT

TABLE 6 : UREA FORMALDEHYDE (UF) RESINS
SUPPLY/DEMAND 1988

(TONS X 10³)

REGION COUNTRY	CAPACITY	PRODUCTION	IMPORTS	EXPORTS	ACTUAL CONSUMPT.	PRODUCTION
						CAPACITY §
E.E.C						
Benelux	127.0	90.0	61.0	46.0	105.0	71
Denmark	39.0	29.0	2.0	8.0	23.0	74
France	190.0	136.5	74.0	31.0	179.0	72
Germany, West	412.0	329.0	180.0	130.0	463.0	80
Greece	13.0	12.0	4.0	.0	16.0	92
Ireland	.0	.0	13.0	.0	13.0	-
Italy	387.0	315.0	18.0	90.0	240.0	31
Portugal	66.0	50.0	3.7	.0	53.7	76
Spain	137.0	116.6	8.4	13.6	111.4	85
United kingdom (UK)	130.0	115.0	5.5	31.0	90.0	88
SUB-TOTAL	1418.0	1276.1	369.6	349.6		91
WESTERN EUROPE (NOW EEC)						
Austria	118.0	108.0	25.0	51.0	85.0	92
Finland	75.0	34.0	5.0	1.0	38.0	45
Norway	78.0	42.0	3.0	15.0	30.0	54
Sweden	131.0	71.0	15.5	8.5	78.0	54
Switzerland	23.0	18.0	54.0	1.0	71.0	78
Turkey	75.0	58.5	.0	27.0	31.5	78
SUB-TOTAL	500.0	331.5	102.5	103.5		66
EASTERN EUROPE	N.A	N.A	N.A	N.A	N.A	N.A
NORTH AMERICA						
Canada	227.5	84.0	11.0	7.0	88.0	37
Mexico	87.0	75.0	.0	.0	75.0	86
United States	994.0	646.0	11.0	4.0	654.0	65
SUB-TOTAL	1308.5	805.0	22.0	11.0		62
LATIN AMERICA						
Andean Countries	47.0	9.0	3.0	.0	12.0	19
Argentina	53.5	12.3	.3	1.0	11.6	23
Brazil	168.0	98.8	.1	.1	99.0	59
Chile	23.0	12.1	.6	1.0	11.7	53
SUB-TOTAL	291.5	132.2	4.0	2.1		45
OCEANIA						
Australia	91.0	50.0	.0	.0	50.0	55
New Zealand	44.0	29.0	1.0	.0	30.0	66
SUB-TOTAL	135.0	79.0	1.0	.0		59

TABLE 6 : UREA FORMALDEHYDE (UF) RESINS
SUPPLY/DEMAND 1988

(TONS X 10³)

REGION COUNTRY	CAPACITY	PRODUCTION	IMPORTS	EXPORTS	ACTUAL CONSUMPT.	PRODUCTION ----- CAPACITY %
ASIA						
Asia, Southeast	822.0	438.0	10.0	2.0	446.0	53
India	27.0	11.0	.0	.0	11.0	41
Japan	505.0	248.0	6.0	1.0	253.0	49
Korea, South	124.0	113.0	.0	.0	113.0	91
Taiwan	132.0	109.0	.0	4.0	105.0	83
SUB-TOTAL	1610.0	919.0	16.0	7.0		57
MIDDLE EAST						
Iran	.0	.0	27.0	.0	27.0	-
Saudi Arabia	.0	.0	.7	.0	.7	-
SUB-TOTAL	.0	.0	27.7	.0		-
AFRICA						
Algeria	8.0	7.0	2.0	.0	9.0	87
South Africa	98.0	54.0	.0	.0	54.0	55
SUB-TOTAL	106.0	61.0	2.0	.0		58
WORLD TOTAL	5369.0	3603.8	544.8	473.2	3677.6	68

Sources: S R I

CHAI - HOUSTON

SIRLITE - MILAN

DEUTSCHE BAKELITE - FRANKFURT

TABLE 7: MELAMINE-FORMALDEHYDE (MF) RESINS
SUPPLY/DEMAND 1988

(TONS X 10³)

REGION COUNTRY	CAPACITY	PRODUCTION	IMPORTS	EXPORTS	ACTUAL CONSUMPT.	PRODUCTION CAPACITY %
E.E.C						
Genelux	12.0	10.0	10.0	1.0	20.0	83
France	8.1	5.0	23.7	2.8	29.0	62
Germany, West	125.0	61.0	13.0	50.0	88.6	49
Greece	.0	.0	12.0	.0	12.0	-
Ireland	.0	.0	1.0	.0	1.0	-
Italy	45.0	34.0	1.0	10.0	26.0	76
Portugal	6.5	2.5	.5	.0	3.0	38
Spain	9.0	7.2	1.8	1.7	7.3	80
United kingdom (UK)	23.0	9.0	5.0	2.5	10.5	39
SUB-TOTAL	225.6	128.7	68.0	68.0		57
WESTERN EUROPE (NON EEC)						
Austria	27.0	22.0	3.0	10.0	15.0	81
Finland	21.0	5.0	1.1	1.0	5.0	24
Norway	8.0	8.0	.0	1.0	7.0	100
Sweden	22.0	10.0	3.5	2.6	10.9	45
Switzerland	.0	.0	4.0	1.0	4.0	-
SUB-TOTAL	78.0	45.0	11.6	15.6	41.9	58
EASTERN EUROPE	N.A	N.A	N.A	N.A	N.A	N.A
NORTH AMERICA						
Canada	34.0	6.0	4.0	1.5	7.2	18
Mexico	9.0	4.7	.0	.0	4.7	52
United States	120.0	85.0	2.5	7.0	114.0	71
SUB-TOTAL	293.7	223.7	6.5	8.5		76
LATIN AMERICA						
Andean Countries	19.0	9.0	1.5	1.0	9.0	47
Argentina	9.3	2.1	.0	.0	2.1	23
Brazil	25.0	13.2	.9	.0	14.1	53
Chile	.5	.2	.1	.0	.3	40
SUB-TOTAL	53.8	24.5	2.5	1.0		46
OCEANIA						
Australia	18.0	10.0	.0	.0	10.0	56
New Zealand	4.0	2.0	.0	.0	2.0	50
SUB-TOTAL	22.0	12.0	.0	.0		55

**TABLE 7: MELAMINE-FORMALDEHYDE (MF) RESINS
SUPPLY/DEMAND 1988**

(TONS X 10³)

REGION COUNTRY	CAPACITY	PRODUCTION	IMPORTS	EXPORTS	ACTUAL CONSUMPT.	PRODUCTION ----- CAPACITY §
ASIA						
Asia, Southeast	38.0	32.0	3.0	3.0	32.0	84
India	5.2	2.5	.0	.0	2.5	48
Japan	153.0	59.0	4.0	3.0	60.0	39
Korea, South	23.0	22.0	.0	.0	22.0	96
Taiwan	13.0	9.0	1.0	2.0	8.0	69
SUB-TOTAL	232.2	124.5	8.0	8.0		53
MIDDLE EAST						
Iran	10.0	6.0	.0	.0	6.0	60
Saudi Arabia	.0	.0	4.0	.0	4.0	-
SUB-TOTAL	10.0	6.0	4.0	.0		60
AFRICA						
South Africa	5.0	2.0	.5	.0	2.5	40
SUB-TOTAL	5.0	2.0	.5	.0		40
WORLD TOTAL	920.3	566.4	101.1	101.1	539.1	62

Sources: S R I

CMAI - HOUSTON

SIRLITE - MILAN

DEUTSCHE BAKELITE - FRANKFURT

TABLE 8 : PHENOL-FORMALDEHYDE (PF) RESINS
SUPPLY/DEMAND 1988

(TUNS X 10³)

REGION COUNTRY	CAPACITY	PRODUCTION	IMPORTS	EXPORTS	ACTUAL CONSUMPT.	PRODUCTION ----- CAPACITY %
E.E.C						
Benelux	26.0	8.0	16.0	12.0	12.0	31
Denmark	2.0	2.0	2.3	.0	4.0	100
France	94.0	65.0	28.5	27.5	66.0	69
Germany, West	178.0	131.0	18.0	56.0	93.0	74
Greece	1.0	1.0	3.0	.0	4.0	100
Ireland	.0	.0	1.9	.0	1.9	-
Italy	89.0	77.0	4.0	12.0	69.0	87
Portugal	10.5	5.0	2.7	1.2	6.5	48
Spain	31.0	23.9	5.9	5.0	21.0	77
United kingdom (UK)	87.0	50.0	13.0	14.0	49.0	57
SUB-TOTAL	518.5	362.9	95.3	127.7		70
WESTERN EUROPE (NON EEC)						
Austria	21.0	16.0	4.0	6.0	14.0	76
Finland	74.0	38.0	.1	2.0	36.0	51
Norway	11.0	8.0	.4	2.8	5.0	73
Sweden	47.0	23.0	2.0	2.0	23.0	49
Switzerland	2.0	2.0	8.0	1.0	9.0	100
Turkey	2.0	2.0	2.0	.0	4.0	100
SUB-TOTAL	157.0	89.0	16.5	13.8		57
EASTERN EUROPE						
Bulgaria	23.0	8.0	.0	.0	23.0	35
Czechoslovakia	20.0	16.5	.0	.0	16.5	82
Hungary	7.5	7.0	.0	.0	7.0	93
Poland	18.0	13.0	.0	.0	18.0	72
USSR	399.0	26.0	.0	.0	26.0	7
Yugoslavia	27.0	8.0	.0	.0	27.0	30
SUB-TOTAL	494.5	78.2	.0	.0		16
NORTH AMERICA						
Canada	198.0	95.0	15.0	15.0	92.0	48
Mexico	36.5	13.8	.8	.0	14.6	38
United States	1160.0	712.0	20.5	19.0	677.0	61
SUB-TOTAL	1394.5	820.8	36.3	34.0		59
LATIN AMERICA						
Andean Countries	21.0	6.0	1.5	.5	7.0	29
Argentina	32.0	4.8	.2	.0	5.5	15
Brazil	142.0	75.1	1.1	.4	76.0	53
Chile	1.0	.3	1.0	.0	1.3	30
SUB-TOTAL	196.0	86.2	3.8	.9		44

TABLE 8 : PHENOL-FORMALDEHYDE (PF) RESINS
SUPPLY/DEMAND 1988

(TENS X 10³)

REGION COUNTRY	CAPACITY	PRODUCTION	IMPORTS	EXPORTS	ACTUAL CONSUMPT.	PRODUCTION
						CAPACITY %
OCEANIA						
Australia	35.0	22.0	.0	.0	22.0	63
New Zealand	7.0	4.0	.0	.0	4.0	57
SUB-TOTAL	42.0	26.0	.0	.0		62
ASIA						
Asia, Southeast	107.0	92.0	11.0	11.0	92.0	86
China	100.0	100.0	.0	.0	100.0	100
India	28.0	15.0	.0	.0	15.0	54
Japan	237.0	141.0	5.0	4.0	142.0	59
Korea, South	51.0	26.0	3.0	1.0	53.0	51
Taiwan	32.0	29.0	4.0	4.0	29.0	90
SUB-TOTAL	555.0	403.0	23.0	20.0		73
MIDDLE EAST						
Iran	.0	.0	3.0	.0	3.0	-
Israel	8.0	8.0	1.0	.0	9.0	100
Saudi Arabia	.0	.0	1.5	.0	1.5	-
SUB-TOTAL	8.0	8.0	5.5	.0		100
AFRICA						
Algeria	6.0	1.6	.0	.0	1.6	27
South Africa	18.0	5.8	1.0	.0	6.8	34
SUB-TOTAL	24.0	7.4	1.0	.0		31
WORLD TOTAL						
	3389.0	1881.5	181.4	196.4	1887.7	57

Sources: S R I

CMAI - HOUSTON

SIRLITE - MILAN

DEUTSCHE BAKELITE - FRANKFURT

2.2

FORMALDEHYDE 37% SOLUTION

From table 5 we understand that formaldehyde 37% solution is performing in the world average not too satisfactory with a 69% exploitation rate, far from the 84% considered as a normal production rate. If we analyse the situation in detail, we can assume that this relatively acceptable result is due mainly to the acceptable performance of EEC countries.

The countries of the area under survey show 62% for North America and only 45% for Latin America. Such poor results are the natural consequence of the negative trend in the consumption development of formaldehyde based resins.

2.3

UREA-FORMALDEHYDE RESINS (UF)

We understand from table 6 that the average exploitation rate is 68%: unsatisfactory but still the best within the area of formaldehyde based resins. Again we notice that the positions are kept only by EEC producers, who can rely on a downstream market sustained by a very well developed and integrated industrial structure.

U.S.A. are close to the world average with a 65% exploitation, but Latin America countries reach only 45%.

We want to draw the attention anyway on the fact that the bulk of UF resins consumption is represented by the wood industry demand: chipboards and fibreboard production absorbs more than 73% of the total resin output. Molding compounds represent 3% only of UF market.

2.4

MELAMINE - FORMALDEHYDE RESINS MF

The rate of exploitation as per table 7 results even lower, being the world average only 62%; in this case EEC is not helping; only Italy is doing well due to high demand for laminates from the furniture industry, which is worldwide the relatively most important one.

U.S.A. shows a reasonably lively demand but Latin America countries are performing poorly with only 46%.

The major outlet is wood and furniture industry where laminates represent 65%, and surface coatings 30%, in total approx. 95% of the demand. The molding compound share is of minor importance.

2.5 PHENOL - FORMALDEHYDE RESINS PF

PF resins are, from a technical point of view, the most sophisticated and consequently they present serious know-how problems. Because of this reason countries like S.S.R.U. or Yugoslavia show extremely poor exploitation rates of their installed capacity, due to lack of up-dated production know-how.

According to table 8 the best performances are from Italy, Spain and Germany. Production of U.S.A. suffers of constraints coming from more rigid rules on labour & environment. Latin America countries average exploitation does not exceed 44%.

The main outlet, as for UF resins is represented by the wood industry. The end uses are the same as for UF resins: chipboards and fibre boards when water resistance requested, as well as marine plywood.

The demand of the wood sector covers approx. 40% of the total supply.

An other important outlet related to the wood and furniture industry is paper impregnation for laminates production, which shows a 10% participation to the market.

2.6 WORLD SUPPLY/DEMAND FORECAST

The trend of installed capacities of formaldehyde and formaldehyde based resins has been characterized during the last decade by a steady situation.

No major producer in the industrialized countries erected new production units and some of them as for instance Degussa, Hoechst, DSM, Borden, Formica, Monsanto, Reicholdt, Resem, Sprea have put on stand-by a number of plants.

The average rate of exploitation of the installed capacities has been also fairly low and some increases shown in the ISR statistical tables may be caused by modification of the product mix. As a matter of fact ISR data are expressed always in terms of formaldehyde content in units.

During the years 1988 and 1989, the exploitation rate reached a peak, but a recession is foreseen starting from 1990. In fact the provisional data for 1990 show a decrease of 15% in UF resins production and of approx. 1% for PF and MF.

In the next two years 1991-1992 a further reduction of approx. 2% per year is expected due to the recession of building and furniture industries.

Only by the end of 1993 an improvement is considered possible, but the growth rate is forecasted in the terms of 1.5/2%.

3. **REGIONAL MARKET**

The regional market consists of the countries which joined CARICOM - Caribbean Common Market. Those countries are: Antigua & Barbuda, Bahamas, Barbados, Belize, British Virgin Islands, Dominica, Dominican Republic, Grenada, Guyana, Haiti, Jamaica, Montserrat, Netherlands Antilles, St. Kitts-Nevis, St. Lucia, St. Vincent & Grenadines, Trinidad & Tobago.

CARICOM as well as all Central American countries (with exception of Nicaragua), enjoy of the Caribbean Basin Initiative, which came into force since beginning 1984 in the light of the U.S. economic policy in the area.

President Reagan's Caribbean Basin Initiative (CBI) came into effect on January 1, 1984. The beneficiaries are the above listed CARICOM countries, as well as all the Central American countries, except Nicaragua.

3.1 **FORMALDEHYDE AND FORMALDEHYDE BASED RESINS**

According to tables 5,6,7 and 8, CARICOM countries are not producing commonly formaldehyde based resins and also import and consumption are of small importance.

The only exception is Trinidad and Tobago, having a UFC 85 unit at Point Lisas, with an installed capacity of 12,000 tons/year and an actual production of 5,000 tons/year (42% exploitation rate).

The imports in the area of formaldehyde based resins are of extremely marginal importance and the overall Caribbean market does not exceed 600-700 tons per year.

The two main outlets consists of some small plywood productions:

- Guyana 330-360 tons/year of UF adhesives
- Belize 80-100 tons UF adhesives

The second major outlet are corrugated paperboard and carton boxes:

- Guyana: approx. 10 tons/year represent the potential yearly demand of Seals and Packaging Industries Ltd (Sapel) of Georgetown (the bulk of the consumption are starch based glues);

- Jamaica: 3 carton packaging producers are located at Kingston and supplied with a total of approx. 500 tons/year UF based adhesives by Henkel. The above mentioned customers are:

. Jamaica Packaging Industries Ltd. Dr. Marcus Garvey Ave, Kingston Ind.

. Konvertra Ltd. - Kingston - Port Royal Street, 93

. West Indies Pulp & Paper Ind. Ltd. - West Kinghouse Rd, 19 Kingston

As far as molding compounds are concerned there is no production and no downstream processing unit.

All plastic converters are using exclusively thermoplastic resins and the output consists of low-technology products.

The main reason of this situation is the too small size of each domestic market which could not grant the pay-back of the capital investment and the marketing and distribution costs of the produced items in the micro potential export markets within CARICOM.

4. T & T MARKET

4.1 ACTUAL DEMAND

The major and sole important outlet for formaldehyde based resins is presently the urea plant at Point Lisas which utilizes 5,000 tons/year of UFC85 for coating of urea granular fertilizer produced in a quantity of approx 520,000 tons/year.

The second outlet, consists of a few adhesives producers of which only one has a production capacity of some importance.

The above adhesives producers are:

- Handy Equipment Ltd. - having a consumption of approx. 240 tons/year formaldehyde: they are used to be supplied with powdered formaldehyde from Germany and Venezuela. A small quantity of UFC 85 is also purchased from time to time from the the local Trintoc plant: anyway they are claiming that they cannot rely too much on the local product because of its chemical unstability, typical of UFC; in fact they are obliged to treat it and immediately spray-dry in order to obtain better stabilization.

Handy sells to Plywood Industries Ltd. of Guyana small quantities of UF adhesives in the range of 10-15 tons/month. Some more 5-10 tons/month are exported to other CARICOM countries, mainly Barbados and Belize. The bulk of their formaldehyde 37% in-put is utilized for production of omo and co-polymeric acetalic glues.

They have a production of 480 tons/year omo-polymeric and of 120 tons/year co-polymeric; they produce also 120 tons/year starch based glues.

According to Hardy Equipment Ltd. they have available technology and know-how for PF resins, which they already produced experimentally.

- L.L. Williams Co. and Superchem Products have only very small glues production units and generally do not use formaldehyde, as the major share of their out-put consist of varnishes and paints.

No termosetting resins converting unit exists in Trinidad and Tobago, so that formaldehyde based compound cannot be processed.

POTENTIAL DEMAND

The investigation of Trinidad and Tobago's domestic market for UFC derivatives led to the identification of 4 outlets:

- plywood factory
- particle board factory (ex Bagasse)
- melamine sheets unit (if venture realistic)
- expansion of T & T Urea fertilizers capacity

4.2.1

Plywood factory

Carybbean Plywood Co. Ltd. of Point Lisas (Trinidad) is a new formed company owned as follows:

- 40% Japanese
- 40% U.S.A.
- 20% local investors (represented by Mr. Leslie Lucky - Samaroo)

The property therefore is 100% private.

The Japanese participation is only financial.

The Americans are going to provide lumber supply and finished product marketing.

The local group of investors is expected to supply management. Mr. Samaroo as Chairman seems to be a very active man.

For the technical management an American engineer hired from Oregon will be responsible; the foreseen out-put is 100,000 cubic meter plywood.

White American pine will be shipped from Mobile, Louisiana.

The finished product will consist totally of construction plywood, 90% of which having 4 mm thickness. The total output will be exported to Portorico and to Mobile. A time-freight vessel is planned to shuttle to and from Trinidad and U.S.A..

The glue needed will be urea-formaldehyde based and the estimated demand will be approx. 6500-7000 tons of UF 65 glue equivalent to 5000-5400 tons UFC 85 approx.

The production of adhesives will be integrated and Caribbean Plywood Co. has already chosen the glue production technology, which is South Korean: the contract with the suppliers of the equipment, Messrs. Young Dong Co. Ltd. of Seoul has been already signed.

The raw material for the above resin should be purchased on the spot: that means that approx. 5000-54000 tons UFC 85 will be needed from Trintoc.

As a matter of fact there are two good reasons for purchasing exclusively Trintoc UFC:

- short and critical shelf life of UFC which makes advisable a local supply;
- saving on transportation which in the case of local supply could be carried out by using simply some special containers, already contracted;
- necessity of reaching and possibly exceeding 35% of local production factors to have duty free access to U.S.A. granted, in accordance with CBI rules.

A constraint to this solution is represented by cost/price of Trintoc's UFC: Trintoc's production cost is 1,20 TT Dollar (0.28 US Dollars) per kilo of UFC and they are used to sell their 5,000 tons/year of UFC 85 to T & T Urea Co. Ltd. at TT\$ 1,60 (0.38 US Dollars).

This price can be afforded for urea coating material, but would be unacceptable for the UFC to be used as intermediate for UF glues.

We could not understand if Trintoc is really prepared to meet Caribbean Plywood Co.'s requests: as a matter of fact adhesives should not exceed a share of 3-5% in plywood production costs. Caribbean Plywood is claiming that they have better quotations for UF glues from overseas, 0,80 TT \$ per kilo, (US \$ 0.188) F.O.B.; but considering an incidence of freight rate of approx. 0.85 TT\$ (US\$ 0.20) the C&F price would result equal to Trintoc's price.

4.2.2. Particle board factory

A particle board production line based on bagasse was established by the end of the 70ties, but after a short period it has been put on stand-by because of a number of technical and managerial problems.

The main technical problems arised form inadequate crashing mills (too weak) and from the impossibility of a sufficient depuration from residual sugar in bagasse wastes, which affected the conglomeration process.

The factory, located close to Point Lisas, is not operational since approx. 10 years.

According to a study carried out recently by CARIRI-Caribbean Industrial Research Institute of Port of Spain, the local market for particle board is of such interest that a rehabilitation of the former bagasse plant would be economically advisable. The investment would be in the area 4-4,5 mil. US\$. On the other hand, we could not understand how the solution of the problem of bagasse depuration has been foreseen to be solved; on the contrary, there are rumors on a possible new paper and pulp production unit in Trinidad which is supposed to compete for purchasing bagasse as a raw material.

At this point, anyway, a raw material problem does not exist anymore as a considerable quantity of more suitable wooden wastes will be available from the new plywood factory. As a matter of fact at least 20% of the total lumber in-put will be available for a possibly integrated particle boards production line.

The local shareholders of Carabbean Plywood Co. are ready to take over the old bagasse plant (practically to be rebuilt) and take advantage not only of the horizontal industrial integration with plywood production but also of a marketing integration: in fact the plywood distribution network, already available, could be utilized perfectly also for chipboards.

Melamine sheets for finishing can be imported from U.S.A. at good prices and very low transport cost, by using the foreseen shuttling vessel. Anyway at this stage some political problems are slowing down the take-off of this project.

4.2.3

Melamine laminates

In case the particle board factory is revamped a demand for laminates would arise in Trinidad.

In such an integrated complex MF resins and melamine sheeting could be considered: it would become necessary then a detailed feasibility study, which should keep anyway into serious consideration the competition of U.S.A. laminate producers.

4.2.4

Coating for Urea Fertilizers

Presently 5,000 tons/year UFC 85 are utilized for coating slow-release urea granules.

A further 5,000 tons/year could become necessary when the new ammonia and urea plant, planned by NORSKHYDRO coming into operation, not earlier than 1995-96.

5. **T & T SUPPLY OF FORMALDEHYDE BASED RESINS**

T & T local market of formaldehyde based resins processors is supplied mainly by imports of powdered UF. The total input is less than 100 tons/year and 80-90% of this quantity is utilized by Handy Equipment for producing glues.

As already mentioned, small quantities of UFC 85 are supplied for the same application by Trintoc. The bulk of Trintoc's production (5000 tons/year) is supplied through a direct pipeline to T & T Urea Co. Ltd.

The new plywood factory, planned to start-up production August 1991 will require approx. 5000-5500 tons UFC 85 for the integrated glues production unit.

In the case, most probable, that a long term contract is signed between Trintoc and Caribbean Plywood Ltd., Trintoc's formaldehyde yearly production will be placed totally.

Trintoc's management declared that they can even exceed the installed 12,000 tons capacity and that they already reached experimentally such target. We are convinced that it can be true, but only for a short period, as in our experience on yearly terms seldom 90% of name plate capacity has been attained by the actual production.

5.1 **UFC 85 FUTURE SUPPLY**

If the project for revamping the ancient bagasse plant goes ahead with the re-building of a wood particle board production unit, at least 2-3,000 tons will be needed further.

Moreover it is reasonable to believe that the foreseen expansion of T & T urea capacity due to the new Norkskhydro project for production of approx 500,000 tons urea, will cause an additional demand for UFC 85 of other 5,000 tons/year. The present installed capacity of 12,000 will not be able to meet at that point the demand of the market.

Under such circumstances the opportunity of an expansion of UFC capacity up to 24,000 tons UFC should be taken into consideration and a techno-economical feasibility study could become advisable, after Norkskhydro's project definitely confirmed.

5.2 T & T COST/PRICE RATIO VERSUS INTERNATIONAL COST/PRICE RATIO

Trintoc plant is producing UFC 85 at a cost of 1.20 TT\$ (0.28 US\$) per kg and is used to sell to the local urea plant on contract basis at 1.60 TT\$ (0.38 US\$), ex-works.

The average costs of the leading producers for a comparable product is 0.22/0.23 US\$ (0.93-0.98 TT\$) and the contract prices presently are in the range of 0.29 - 0.30 US\$ (1.23 - 1.27 TT\$), F.O.B.

On the spot market prices can reach 0.34-0.35 US\$ (1.40 - 1.50 TT\$), F.O.B.

UF 65 glues, commonly used for plywood, are quoted on the international market in the region of 0.20-0.22 US\$ (0.85 - 0.93 TT\$), F.O.B.

5.2.1 Freight rates

Formaldehyde based resins are classified in the shipping tariffs as "harmless chemicals", which in the language of shipowner's means that they can cause some shipping problems.

On the other hand, from merceological point of view, they represent the lowest level of commercial value within the category. The result is a very high freight rate: 201 US Dollars per metric ton from European ports; 160-170 US Dollars per metric ton from U.S. South-East coast. For "special equipment" (for instance conditioned containers) a freight surcharge of approx 15-20% can be requested by shipowners.

5.3 MARKETING & SALES STRATEGY

At present Trintoc is selling their UFC 85 to the urea plant at the very high price of TT \$ 1.60/kilo corresponding to 0.38 US \$. This price is accepted by T & T Urea Co. because of three reasons:

- 1) C&F prices of imported UFC 85 would be by far higher than the local product, due to the above mentioned freights;
- 2) extremely small incidence of coating materials costs on the overall production cost, and availability of a direct pipeline connecting Trintoc UFC tankers with the urea plant, so that transportation and shelf-life problems are eliminated;
- 3) political reasons as both companies are state owned.

Trintoc's price compensates the production cost which, due to the too small size of the unit and because of its underutilization (only 42%) results very high (25% more than the average international cost).

We guess that by reaching a utilization rate of 80-90%, the costs could drop to normal levels, (we have not available any techno-economical data from Trintoc), in any case it is undoubtful that the price which Trintoc can obtain on the free market and from a private customer like Caribbean Plywood has to be aligned to the current international price.

In order to avoid the killing of the new plywood venture from the beginning we cannot forget that all plywood output is also supposed to be exported at international price level.

In the present situation Trintoc's management should accept consequently a reasonable sacrifice on the price in order to build up the new rising market. Later if the hypothesis of a local shortage in UFC 85 will match they could be in a position to get even over-profits, by taking advantage of the shipping problems that their local private customer should face if obliged to import UFC from overseas and of the better prices which Caribbean Plywood Co. probably will be able to obtain due to the forecasted plywood shortage on the world market.

ANNEX 1

POLITICAL AND ECONOMICAL SITUATION OF TRINIDAD & TOBAGO

(Source: E.L.V. 1990 YEARLY REPORT)

In 1956 the People's National Movement (PNM) founded and led by Dr. Eric Williams, won control of the Legislative Council. Dr. Williams became the country's first chief minister and in 1962, after independence, its first prime minister. He remained in power for 19 years and was succeeded on his death in 1981 by the deputy leader of the PNM, George Chambers.

In the November 1981 general election Mr. Chambers and the PNM won 26 assembly seats to ten for the opposition National Movement. Over the next five years the PNM's popularity declined steeply as economic difficulties intensified and allegations of corruption in high places and inefficiency became more widespread. In the general election of December 1986 the opposition National Alliance for Reconstruction (NAR) won a landslide victory under Mr. A.N.R. Robinson, taking 33 out of 36 assembly seats including that of the outgoing prime minister, and ending the PNM's 30 year reign.

The NAR was formed in 1985 as a coalition of four opposition parties, and became a single unified party in February 1986. Mr. Robinson, the prime minister, is an experienced politician; he was a founder of the PNM and became deputy political leader of the party, finance minister and foreign affairs minister, but he resigned in 1970 after repeated differences with the late Eric Williams. He established his political base in his native Tobago, where he headed the Democratic Action Congress and the Tobago House of Assembly.

Mr. Robinson is a reformist and a moderate, whose attempts to counter many years of economic decline have so far centred on reducing the role of the state and opening the economy to foreign participation. He was finance minister for the first two years of the NAR government and was succeeded in February 1989 by Selby Wilson.

The NAR is an uneasy coalition of pro-business and pro-labour elements, cutting across Trinidad's different ethnic communities. It was strongly backed by the private sector when elected. However, the continuing economic difficulties in 1987 put the NAR under severe strain, with several cabinet members from the trade union based United Labour Front (ULF) criticising both government policy - for favouring the business sector - and the prime minister's authoritarian leadership style. In early 1988 Mr. Robinson sacked four ULF members from his cabinet, including the foreign minister and deputy leader of the NAR, Basdeo Panday. The conflict raised the difficult issue of racial divisions

within Trinidadian society, as the sacked ministers derived much of their support from the Indian community. Despite attempts at reconciliation, the threat of an irreconcilable split along ideological lines remains.

One of the early moves by the new government was to grant full internal self-government to Tobago, provided for under legislation in 1980 but not wholly implemented. The Tobago House of Assembly was given full control over revenue collection, economic planning and public services. Jeff Davidson, the former deputy chairman of the assembly, was appointed chairman in place of Mr. Robinson.

POPULATION AND SOCIETY

DEMOGRAPHIC TRENDS

Trinidad has an area of 4,827 km² and Tobago 301 km². The total population was estimated at 1.235 mm in mid-1988, giving a population density of 240.8 per km². The average annual population growth rate between 1980 and 1987 was 1.6 per cent. In 1987 the urban population was estimated at 67 per cent of the total. In 1987 life expectancy at birth was 70 years; infant mortality was 20 per 1,000 live births compared with 47 in 1965. In 1988 43 per cent of the population was aged under 20.

The chief towns in Trinidad are Port of Spain, the capital (population in 1987, 444,000), San Fernando (34,000) and Arima (29,000); Scarborough (3,000) is the chief town of Tobago. Some 43 per cent of the population are of African descent, and 40 per cent of East Indian descent; the remaining 17 per cent are of mixed descent, and of European, Chinese and Arab descent.

SOCIAL CONDITIONS

Education is free and compulsory from the age of six to twelve. In 1985 there were 468 primary schools, with 168,79 pupils, 96 secondary schools, with 92,036 students, and three vocational institutions, with 2,849 students. Trinidad & Tobago houses the St. Augustine campus of the University of the West Indies (UWI) which in 1985 had 2,684 students. The literacy rate was 97.2 per cent in 1980. The government intended to spend TT\$400 mn on education development between 1985 and 1990, and aims to provide universal secondary schooling. The proportion of the relevant age group attending secondary school is estimated to have risen from 36 per cent in 1965 to 76 per

cent in 1986.

In 1984 there was one doctor for every 960 people. In 1979 hospitals and clinics numbered 25, of which 15 were government owned and ten private; there were 39 hospital beds per 10,000 people. Public health expenditure was 6.4 per cent of the budget, at US\$83.9 per caput. Government social security schemes covered retirement, maternity, sickness, death and industrial injury. In 1985 new legislation made redundancy payments to employees the first charge on a company going into liquidation.

CURRENCY

The Trinidad & Tobago dollar was pegged to the US Dollar from 1976, at a rate of TT\$2.4, until December 17, 1985, when the currency was devalued to TT\$3.6 to the US Dollar. The old rate was maintained for imports of specific essential goods, including many food items, drugs, school books and agricultural inputs. In the February 1987 budget this preferential rate was abolished and the unified rate of TT\$3.6 = US\$1 became applicable to all imports. The government responded to pressure for a further devaluation in August 1988, adjusting the value of the TT\$ from TT\$3.60 = US\$1 to TT\$4.25 = US\$1.

THE ECONOMY

Like most other Caribbean islands, Trinidad's economy was for a long period based on sugar and other agricultural products for the benefit of colonial trade. The majority of its population - originally either African slaves or East Indian indentured labourers - was introduced to provide labour for the sugar plantations. However, the economy was transformed by the discovery of oil, the production and refining of which now form the backbone of the economy.

The petroleum industry is still a major contributor to GDP, although its share fell from 42 per cent in 1980 to 23 per cent in 1987. Proven oil reserves are sufficient for less than ten years extraction at current rates. Further oil exploration has been encouraged by tax changes in the 1988 budget.

Diversification of the economy away from dependence on oil has been a priority during the 1980s. There are significant reserves of natural gas which are providing the basis for new industrial development, especially petrochemicals.

Manufacturing industry nevertheless accounted for only 9.3 per cent of GDP in 1988. Services, including government operations, and construction are of major importance. Tourism is a major foreign exchange earner and various infrastructural projects are being carried out to assist in its expansion.

After several years of relative prosperity based on oil revenues, recent years have been more difficult for Trinidad. Real GDP fell between 1982 and 1988 by an average of 5.9 per cent per annum, and unemployment rose from 9.9 per cent in 1982 to 22.1 per cent in 1988. Lower oil prices led to balance of payments deficits, which were met from the substantial foreign exchange reserves accumulated during more favourable years. These reserves are now virtually exhausted and a strict regime of import licensing and foreign exchange control is in force.

The government budget deficit is also a major problem, and the new government's budgets in 1987 and 1988 contained further austerity measures to deal with this. Although 1987 saw an improvement in the overall balance of payments, substantial foreign exchange problems remained. In 1988 the government finally decided it had no alternative but to go to the IMF for the first time, both for balance of payments support and to make possible the restructuring of its foreign commercial bank debts.

It negotiated a 14 month IMF stand-by arrangement for SDR99 mn (equivalent at the time to about US\$141 mn), commencing in January 1989. SDR42.5 mn of the total came in the form of a compensatory and contingency financing facility (CCFF), to be drawn down if oil prices decline and interest rates on foreign debt rise during the course of the agreement.

Trinidad & Tobago has also been separately allowed SDR85.05 mn under the IMF's compensatory financing facility (CFF) to compensate for shortfalls in export earnings up to the end of June 1988.

The Letter of Intent from the government to the Fund outlined Trinidad & Tobago's objectives during the period of the stand-by arrangement as follows:

- . restoring real growth to the economy by 1990-91;
- . reducing the external current account deficit from 6 per cent of GDP in 1987 to 4 per cent in 1989 and 2 per cent in 1991;

- . rebuilding the Central Bank's net foreign reserves to three months of import cover;
- . reducing the overall public sector deficit to 4 per cent of GDP in 1989 and 1 per cent in 1991;
- . setting quarterly ceilings on the stock of net financial system credit to the public sector;
- . restricting the growth in the net domestic assets of the Central Bank to TT\$40 mn in 1989, compared with TT\$490 mn in 1988;
- . eliminating the foreign exchange allocation system for visible imports by 1990;
- . reducing quantitative restrictions on imports during the next few years.

Trinidad's work force has traditionally been strongly unionised, and the labour movement has been successful in securing a share in a country's oil wealth. In the past the state sector has been active in the economy, particularly in oil, agriculture and major industrial projects. The NAR government has promised to restructure state enterprises, including some privatisations, in an attempt to restore profitability by reducing employment and real wages in these companies.

NATIONAL ACCOUNTS

The 1970s were a period of strong GDP growth on the basis of buoyant oil revenues. More recently the economy has gone into decline due to depressed oil markets and falling oil output. GDP declined by an annual average of 4.2 per cent between 1983 and 1988. It fell by 1.1 per cent in 1986, 2.3 per cent in 1987 and 4.7 per cent in 1988. Oil production went into decline in 1981, recovered somewhat in 1984 and 1985, and declined again in 1986, 1987 and 1988.

Trend of gross domestic product

	1983	1984	1985	1986	1987	1988
Total (TT\$ mn)						
GDP at current prices	19,058	19,060	18,248	17,090	15,933	16,491
GDP at constant (1970) prices	3,111	2,873	2,711	2,682	2,620	2,497
Real increase (%)	-6,7	-7,7	-5,6	-1,1	-2,3	-4,7
Per caput (TT \$ mn)						
GDP at current prices	16,572	16,291	15,464	14,242	13,060	13,288
GDP at constant (1970) prices	2,705	2,456	2,297	2,235	2,148	2,022
Real increase (%)	-8,8	-9,2	-6,5	-2,7	-3,9	-5,8

Source : Central Bank, *Annual Economic Survey*

The government's austerity measures, aimed at overcoming the budget and trade deficits, affected virtually all sectors from 1983 onwards. The most severe falls were in wholesale and retail distribution and construction. The non-oil sector saw a fall in real output of 6.3 per cent in 1988, while the performance of the petroleum sector, including petrochemicals, was not as bad as in previous years, declining by only 1.1 per cent.

Gross domestic product by sector

(% change; 1970 prices)

	1984	1985	1986	1987	1988 ^a
Total	-7.7	-5.6	-1.1	-2.3	-4.7
Oil	10.2	11.5	-0.5	-6.9	-1.1
Non-oil	-9.4	-7.7	-1.2	-1.6	-6.3
of which:					
agriculture	-0.8	7.6	2.2	4.3	11.4
manufacturing	12.4	-10.9	28.3	19.0	-8.3
electricity & water	3.6	1.1	8.9	8.5	0.7
construction	-20.4	-18.2	-17.1	-20.8	-14.9
distribution	-21.5	-19.3	-15.5	-15.2	-19.0
transport, storage & communications	-4.5	-0.1	-1.4	-5.5	-12.0
finance & real estate	-15.1	-9.2	-11.6	-16.0	16.6
government	-1.7	-3.4	-7.7	--	-1.7
education & cultural	1.4	2.0	--	-1.1	9.3
personal services	0.1	5.5	-0.8	5.5	-0.6
hotels	-25.1	-13.7	5.3	-10.3	22.1

a 1982 prices

Sources : CSO, *Review of the Economy*; Central Bank, *Annual Economic Survey*

Sectoral origin of GDP at market prices

(TT\$ mn; current prices)

	1984	%	1988	%
Total	-18,828.7	100.0	16,490.7	100.0
Oil	5,065.9	26.9	3,796.5	23.0
Non-oil	13,762.8	73.1	12,694.2	77.0
of which:				
agriculture	349.4	1.8	743.6	4.5
manufacturing	1,418.6	7.5	1,532.0	9.3
electricity & water	176.9	0.9	234.2	1.4
construction	2,402.4	12.8	1,867.5	11.3
distribution	2,025.6	10.8	1,546.8	9.4
transport, storage & communications	1,752.0	9.3	1,589.0	9.7
finance & real estate	2,179.0	11.6	1,861.1	11.3
government	2,775.7	14.7	2,441.4	14.8
education & cultural	856.4	4.5	743.7	5.5
personal services	533.9	2.7	636.3	3.5
hotels	70.4	0.4	102.1	0.4
correction for imputed service charge	-777.5	-3.9	-604.0	-4.1

Sources : CSO, *Review of the Economy*; Central Bank, *Annual Economic Survey*

Expenditure generating gross domestic product

	1982		1987	
	TT\$ mn	%	TT\$ mn	%
Export of goods & services	6,694	34.9	5,867	35.4
Total consumption	15,135	78.9	13,236	79.9
Gross domestic investment	5,417	28.2	3,125	18.9
Imports of goods & services (at current market prices)	-8,070	-42.1	-5,657	-34.1
GDP	19,176	100.0	16,572	100.0

Source : IMF, *International Financial Statistics*

EMPLOYMENT

The labour force increased from 382,500 in 1980 to 478,800 in 1987 but dropped to 476,800 in 1988, owing to a fall in the participation rate of 58 per cent. There were on average 371,600 people with jobs in 1988, a decline of 0.2 per cent, while the number without jobs fell to 105,200.

Although the unemployment rate fell marginally (to 22.1 per cent) in 1988, unemployment continues to be a major problem. Unemployment is highest in the 15-19 age group (43.3 per cent) and the 20-24 age group (37.1 per cent).

The majority of the labour force has remained in construction, wholesale and retail trade, agriculture, personal services and central and local government. Despite its importance the petroleum industry employed only 4.5 per cent of the employed labour force in 1986.

About half of the work force is unionised, with a higher proportion in industrial and commercial sectors. Most trade unions belong either to the moderate Trinidad & Tobago Labour Congress (TTLC) or the smaller but more radical Council of Progressive Trade Unions (CPTU). Industrial action is prohibited in the police, public service and essential industrial.

Labour force by sector

	June 1983 '000	%	June 1988 '000	%
Agriculture	34,800	8.8	51,200	13.6
Manufacturing (inc. mining & quarrying)	67,600	17.2	55,200	14.7
Construction (incl. electricity, gas & water)	82,300	20.9	48,900	13.0
Transport & communications	27,300	6.9	28,400	7.6
Other services	181,300	46.1	191,900	51.1
Not classified	--	--	300	0.1
Total employment	393,300	100.0	375,900	100.0

Source : CSO, *Review of the Economy*

WAGES AND PRICES

A relatively high rate of inflation prevailed in the late 1970s and early 1980s, but the government's deflationary programmes had some impact in 1984 and 1985, bringing the rate down to 7.7 per cent in 1985, its lowest level since 1971. The inflationary pressures that might have been expected with the 50 per cent devaluation of the Trinidad dollar in December 1985 appear to have been largely contained by contracting aggregate domestic demand. Despite the further devaluation in August 1988, retail price inflation in that year was 7.8 per cent, compared with 10.8 per cent in 1987. Most of this was concentrated in the last quarter, when it rose by 5.1 per cent. Wholesale prices moved

up by 5.9 per cent during the year, compared with 4.4 per cent in 1987, reflecting the higher cost of imported manufacturers' inputs.

From the early 1980s the rate of increase in minimum wage rates has been declining. In the 1970s the impact of high oil prices and a buoyant economy allowed trade unions to demand and secure high wage rises, but recession and rising unemployment in recent years have blunted wage demands and strengthened employers' resistance.

Retail price Index

(Sep. 1982 = 100)

	1982	1983	1984	1985	1986	1987	1988	1989	1990
Annual average	98.6	115.2	130.5	140.5	151.3	167.6	180.6		
% change	11.4	16.8	13.3	7.7	7.7	10.8	7.8		

Source : CSO, *Review of the Economy*

Percentage increase in average weekly earnings

	1982	1983	1984	1985	1986	1987	1988
All industry	17.7	21.2	13.5	4.9	2.0	4.3	1.7
All industry excl. oil & sugar	19.0	24.7	14.9	3.6	3.0	2.5	0.4

Source : CSO, *Review of the Economy*

In 1987 workers' earnings in all industries rose by 4.3 per cent compared with a year earlier, but there was a smaller rise of 2.5 per cent over the same period when oil and sugar are excluded. The substantial increase in earnings for all industries followed a 9.3 per cent drop in the year to June 1986, although by end 1986 overall earnings had risen by 2 per cent.

AGRICULTURE, FORESTRY AND FISHING

Although Trinidad was developed as an agricultural economy, the sector has declined relatively since the discovery of oil. In 1988 it contributed 4.5 per cent of GDP, after showing modest growth of 4.3 per cent in that year. It is relatively labour intensive and consequently accounts for a much higher proportion of employment (11.6 per cent in 1986).

Output of the three major cash crops (sugar, coffee and cocoa) fell steadily from 1975, although sugar production recovered in 1985 and 1986 before falling back in the first six months of 1987. In the 1960s Trinidad was a net exporter of food, but now relies on imports for about 75 per cent of requirements. In 1980 these cost TT\$708 mn, rising to TT\$892 mn in 1984 before declining to TT\$656.6 mn in 1988. In 1979 exports of food and live animals contributed TT\$167.4 mn. Agricultural exports benefited from the devaluations of 1985 and 1988, good weather conditions and more efficient use of resources, including manpower, and after several years of decline had climbed back to TT\$217.7 mn by 1988.

Agriculture's difficulties were directly related to the post -1974 oil price boom. Agriculture could not compete with the high wages being paid by the oil industry, and production declined until 1984.

Production of cocoa and citrus was up by 14.1 per cent and 65.7 per cent respectively in 1988. Coffee production, however, declined by 56 per cent.

Sugar had a good year in 1988, with production up by 6.9 per cent to 91.100 tons. Sugar production is in the hands of one state owned company, Caroni Ltd, Export earnings were TT\$113.9 mn in 1988, thanks to a small increase in the country's quota, which allowed a 2 per cent rise in sugar exports to the USA and EEC of 54,500 tons. The industry was relatively free of industrial interest in 1988.

Main agricultural products

('000 tons, unless otherwise indicated)

	1982	1983	1984	1985	1986	1987	1988
Sugar	78.6	77.4	69.7	81.3	92.3	85.4	91.3
Cocoa beans	2.2	1.7	1.8	1.3	1.4	1.4	4.754 ^a
Coffee beans	1.8	1.4	0.5	2.1	1.3	1.8	582 ^a
Citrus fruits	1.8	5.4	3.3	3.1	4.3	2.9	1,712 ^a
a '000 kg.							

Sources : Central Bank, *Annual Report*, CSC, *Review of the Economy*

Domestic production provides only a minor proportion of the country's meat supplies, with pork and chicken the principal local supplies. Total meat production (excluding poultry) fell from 4.9 mn kg in 1984 to 4.7 mn kg in 1987. Production for the first nine months of 1988 was 3.2 mn kg, on a par with the same period in 1987. Pork production was 3.5 mn kg in 1984 and 3.3 mn kg in 1987, with

production for the first nine months of 1988 being 1.9 mn kg.

About 45 per cent of Trinidad & Tobago is forested, and annual timber production is around 18.5 mn board feet. However, local demand for timber is such that over 22 mn board feet per year have to be imported. There are 62 sawmills several furniture factories and a match factory reforestation has been encouraged to pight erosion.

The fishing industry is not developed and imports are substancial. The catch declined throughout the 1970s, but has recovered somewhat since then, to 3,070 tons on 1986. A new fishing agreement with Venezuela was negotiated in 1985, to replace one which expired in 1984. The scope of the existing fishing agreement with Venezuela is expected to be further extended following the visit of Venezuelan president, Andres Perez, in August 1989.

ENERGY

OIL

The oil industry is the backbone of the economy, amounting in 1987 for about 72 per cent of export earnings, 23 per cent of GDP (at current prices and 26.5 per cent of current government revenue. This dependence has lessened over the last seven years, however, in 1980 the relevant figures were 90.6 per cent, 92 per cent 99.5 per cent. This decline is due, however, not so much to diversification of the economy but to falling oil prices and production difficulties. The situation may be about to change with a major new find in Venezuelan territory raising hopes that a new field may be identified Trinidadian waters.

Crude oil production, exports and reserves

	1982	1983	1984	1985	1986	1987	1988
Production ('000 b/d)	132	158	170	176	168	155	150
Reserves (mn b)	580	630	540	540	610	570	612
Exports of crude oil ('000 b/d)	94	82	90	97	91	78 ^a	75 ^a
a Estimate							

Source : Ministry of Energy

Oil refinery throughout and exports

('000 m³ per day)

	1982	1983	1984	1985	1986	1987	1988
Total output	24.0	11.8	12.2	12.9	13.0	13.7	13.6
Refined product exports	7.3	4.6	4.6	4.0	3.8	4.2	4.2

Source : CSO, *Review of the Economy*

The government has been increasing its stake in the oil extraction industry. Amoco accounted for 45.8 per cent of total production in 1988. Until 1988 Texaco was also a major operator but sold out most of its local assets to the government in that year. 53.5 per cent of production is now from the three state run companies, Trintopec, Trinmar and Trintoc.

As well as producing oil, Trinidad is an important regional refiner of oil and related products. The main refinery, at Point à Pierre, was purchased by the government from Texaco in 1985. The refinery is now operated by Trintoc, as is the second refinery at Point Fortin. Total refinery capacity is now 300,000 b/d. Refinery output was 222,312 b/d in 1980 but dropped to 79,235 b/d in 1985, recovering slightly to 85,035 b/d in 1988. 1989 output is forecast at 76,014 b/d. Capacity utilisation was 16 per cent in 1988. The major refined products are gasoline, gas/diesel oil and fuel oil, representing 20,10 and 56 per cent of refinery output respectively.

RESERVES

Reserves in 1988 were estimated at 612 mn barrels. In an effort to boost reserves, the government announced a more favourable oil tax regime in 1988 designed to encourage exploration and development. Two new offshore licenses have been awarded - the S-11 block off the south coast of Trinidad (Mobil Trintopec) and the Lower Reserve L block off the south east coast (Pecten/Trintoc). Drilling was due to commence before the end of 1989. The licenses are committed to spending US\$42 mn over four years to drill six exploratory wells. Bidding for four new offshore blocks totalling 1.2 mn acres will close at the end of October 1989. Active interest is once more being shown in all aspects of oil exploration in Trinidad, following the prolific finds in the nearby El Furrial basin in north eastern Venezuela.

In March 1989 Trinmar, the country's second largest producer, which operates to the West of Trinidad in the Gulf of Paria, drilled a well to 15,150 ft, which is expected to confirm a large commercial discovery.

GAS

Trinidad has considerable reserves of natural gas; proven reserves at the end of 1985 were 16.9 trillion ft³, enough to last 60 years at 1985 production levels. Probable and possible reserves amount to 22 trillion ft³. The likelihood of there being over 100 years' supply, coupled with oil reserves unlikely to last into the next century, has shaped an industrial policy based on natural gas as a feedstock, notably in petrochemicals.

Production of natural gas has been rising steadily, from 7,229 mn m³, in 1984 to 7,438 mn m³ in 1988. Over 85 per cent of gas production is from Amoco's fields. The utilisation rate increased from 70 per cent in 1981 to 81 per cent in the first nine months of 1987; the remainder was flared. Production of gas for use as fuel was 2,217 mn m³ in 1988, having dropped from a peak of 3,920 mn m³ in 1982 due to the recession. Gas is piped to power stations and factories in the Port of Spain area.

Amoco discovered a major new field at Cassia in 1982, which could eventually yield over 90 mn m³ of gas a day. In 1986 a consortium controlled by the two state oil companies, Trintopex and Trintoc, started work on a gas production platform off the south east coast of Trinidad, aimed at producing 1.75 mn ft³ per day in January 1990. The cost of the project is being met by the companies and by domestic and foreign loans. The scheme is intended to end dependence on Amoco for natural gas. It should provide enough gas to fuel the existing methanol and ammonia factories, plus the second ammonia and urea plant which will be a joint venture between the government and the US company W R Grace (according to the last information Grace sold their share to Norskhydro of Norway).

In April 1986 the government launched a five year pilot project to promote the use of compressed natural gas as an alternative motor fuel. This would reduce domestic consumption of petroleum products as oil reserves decline. However, natural gas is unlikely to replace the export potential of petroleum, as for the time being at least the government has baulked at the high cost (Y\$5 bn) of the liquefied natural gas plant which would be necessary to concentrate the product into

transportable form.

ELECTRICITY

The Trinidad and Tobago Electricity Commission operates three generating plants in Trinidad and one in Tobago. All generation is thermal and the principal fuel used is natural gas. Installed generating capacity in 1984 amounted to 982 mw. Estimated electricity generation in 1988 was 3,355.4 mn kwh, little above the 1987 figure of 3,351.9 mn kwh.

Energy balance, 1988

(mn tons oil equivalent)

	Oil	Gas	Coal	Electricity	Other	Total
Production	8.00	4.05	--	--	0.06	12.11
Imports	0.80	--	--	--	--	0.80
Exports	7.60	--	--	--	--	7.60
Primary supply	1.20	4.05	--	--	0.06	5.31
Final consumption a Output basis	0.80	2.35	--	0.22 ^a	0.06	3.43

Source : Energy Data Associates

ASPHALT

The famous pitch lake at La Brea is the world's largest natural source of asphalt. It produced 20,200 tons in 1988. Production had declined from 63,400 tons in 1978 to 23,200 tons in 1981 before showing a modest revival up to 1983. Since then output has declined steadily.

MANUFACTURING

Despite attempts by the government to diversify the productive base with the aid of tax incentives and import restrictions, manufacturing still plays only a small part in the economy. In 1988 it contributed 9.3 per cent to GDP.

Substantial resources and efforts have been concentrated by the government on the 600 ha Point Lisas industrial estate on Trinidad's west coast. It is designed as a growth area for heavy industry to encourage downstream ancillary and light manufacturing. The project's rationale is that it uses

Trinidad's extensive natural gas reserves as feedstock. A number of state companies and joint ventures with foreign capital have been established, producing ammonia and other nitrogenous fertilisers, methanol, urea, petrochemicals, iron and steel. There is also a motor vehicle assembly plant. There have been some difficulties in recent years, however, as export oriented heavy industries encountered depressed markets and many projects were subject to cost overruns.

Production of nitrogenous fertilisers totalled 2.2 mn tons in 1988, compared with 1.4 mn tons in 1984. The state owned methanol and urea plants have also been successful to date. The Trinidad and Tobago Methanol Co. (TTMC) plant produced virtually at full capacity in 1988 (395,700 tons, of which 377,600 were exported). Planning for a second methanol plant at Point Fortin, with a capacity of 803,000 tons, is going ahead. TTMC will hold 25 per cent of the equity in the Point Fortin plant. The US chemical giant, Union Carbide, has dropped out of the project. A site has been prepared at Point Lisas for a third methanol plant, with a capacity of 549,500 tons. It will be a fully private sector effort, in which the Colonial Life Insurance Co of Trinidad has the majority share.

The centerpiece of the Point Lisas estate, the Iron and Steel Corporation of Trinidad (Iscott), has not been a great success. The state run plant cost US\$468 mn to build but it was immediately subject to anti-dumping lawsuits filed by US steel manufacturers and exports to the USA have effectively been blocked. As a result the plant lost TT\$176 mn in 1984, and in late 1985 a technical and marketing services agreement was signed with Voest Alpine of Austria and Neue Hamburger Stahlwerke (HSW) of West Germany, which led to a doubling of production.

The government has now divested itself of Iscott by leasing it to Caribbean Ispat Ltd, a company owned by the Ispat steelmaking group of India. The lease is for ten years from May 1, 1989. The lease payment to the government is US\$10 mn a year. The lease can be extended for a further five years and Caribbean Ispat has the option to buy the plant after the first five years of the lease. Ispat has undertaken to make an initial capital investment of TT\$50 mn in the plant.

Other main manufacturing industries are motor assembly, durable consumer goods and garments. The environment for export manufacturing has been improved by currency devaluation, but the domestic market remains very weak. The 1986 budget removed the stamp duty on imports of raw materials introduced in 1985, heeding manufacturers' criticisms, and also removed purchase tax on

packaging materials.

The government has also announced that it is studying a report on a revised foreign investment code, recommending that foreign investment should be particularly welcome in petrochemicals, export oriented manufacturing and tourism. Sectors reserved for nationals should include wholesale and retail trade, transport, broadcasting, land development and personal services.

The government removed the boards of all 67 state owned companies in an attempt to break links with the previous PNM government. The operating deficits and debt repayments of state enterprises (which are mostly guaranteed by the state) have been identified as the main causes of public sector current account deficits. In the short term the government has been attempting to trim operating losses, although the longer term objective is to privatise many of them. The government is expected to retain control of oil, natural gas and public utilities.

Trinidad & Tobago's first project under the Caribbean Basin Initiative (CBI) - a bronze casting plant - was formally opened on February 20, 1987. Located in north east Trinidad, it is a 40/60 joint venture between the country's largest conglomerate, Neal and Massey, and Castech Inc of the USA. It involves making continuous bronze castings for the American market using local energy and labour and American machinery, and is expected to earn TT\$15 mn a year in foreign exchange.

Production of selected manufacturers

	1983	1984	1985	1986	1987	1988
Cement ('000 tons)	389.8	405.4	328.5	337.6	326.1	359.8
Fertiliser ('000 tons)	1,274.3	1,458.1	1,663.5	1,883.9	1,836.7	2,206.0
Motor vehicles (units)	20,677	22,753	11,900	10,700	5,171	4,320
Television sets (units)	21,217	19,150	21,473	15,500	10,383	6,332
Refrigerators (units)	19,952	21,803	6,400	14,400	15,116	13,894
Edible oils ('000 litres)	8,829	6,234	5,926	12,065	10,048	8,289

TRANSPORT AND COMMUNICATIONS

The road system comprises 4,906 miles of all weather roads, of which 2,480 miles are paved. Considerable capital expenditure has been made on roads in recent years and improvements are still under way. In 1987 there were 240,000 private and 80,000 commercial motor vehicles.

The only international airport is at Piarco, near Port of Spain. Tobago's Crown Point Airport is being brought up to international standard with a TT\$24.2 mn investment, including the construction of a 9,000 ft runway. The national carrier is British West Indian Airways (BWIA). After making a TT\$71 mn loss in 1980 BWIA has steadily improved its position, cutting losses to TT\$37 mn in 1985, TT\$11.4 mn in 1986, and TT\$7.7 mn in 1987, despite a decline in traffic. The airline has been ordered by the government to break even.

Port of Spain is the chief port, with others at Point Lisas, Chaguaramas Bay and Point Tembladora. The government owns the Shipping Corporation of Trinidad & Tobago and is part owner of the West Indies Shipping Corporation (Wisco). The inner harbour in the port of Scarborough, Tobago, is being deepened to accommodate cruise liners. Completion is planned for early 1990. In June 1986 a TT\$98 mn contract was signed with a West Germany company to build a ferry linking the two islands of Trinidad and Tobago.

The telephone system is operated by the state owned Trinidad & Tobago Telephone Company (Telco). The number of subscribers has been expanding rapidly, with 210,348 lines connected at the end of 1986 and 220,379 by July 1987. At the end of 1987 two new exchanges were commissioned, resulting in significant line expansion in several areas.

MASS MEDIA

In 1987 there were four daily newspapers with a combined circulation of 172,801. The state television company operated on a commercial basis; there was one state and one commercial radio station. In 1986 there were an estimated 345,000 television sets and 552,000 radio sets.

FINANCE

Monetary and fiscal developments have been closely linked with the fortunes of the oil industry. The period between 1972 and 1981 saw very rapid monetary expansion as the build-up of foreign assets increased liquidity in the economy.

For the financial system it was also a time of expansion, with the establishment of finance houses and, in 1981, a stock exchange. With the fall in oil revenues during the 1980s, the process has been reversed: the depletion of external assets contributed to a market slowing down of monetary growth.

Trend of money supply and credit

(TT\$ mn; end of period)

	1984	1985	1986	1987	1988a
Money supply (M1)	2,125.3	1,916.1	1,840.9	1,698.7	1,606.6
of which :					
demand deposits	1,381.0	1,214.5	1,145.2	997.4	923.0
currency outside banks	744.3	701.6	695.7	701.3	683.6
Time & savings deposits	6,004.5	6,304.2	6,238.9	6,492.0	6,735.0
Money supply (M2)	8,129.8	8,220.3	8,079.9	8,190.7	8,341.6
Domestic credit	6,763.3	6,984.2	7,176.1	7,292.9	7,596.8
Net credit to government	---	175.5	1,444.6	2,062.2	2,455.5
Bank credit to private & public sectors	6,788.7	6,949.6	7,137.5	7,708.9	7,629.1
Bank rate (%)	7.5	7.5	7.5	7.5	9.5

Source : Central Bank

FOREIGN TRADE

Between 19874 and 1981 Trinidad & Tobago's lucrative oil sector produced a series of balance of payments surpluses. The lower oil prices of the 1980s caused trade deficits in 1982 and 1983 while the move into surplus in 1984 and 1985 can be attributed to the exchange control and import regulations introduced in October 1983. The trade surplus in 1986 amounted to US\$154 mn, a significant fall from the 1985 figure of US\$756 mn. The most important factor of 1986 was the collapse in international oil prices, which reduced the value of oil exports by US\$800 mn. In 1987 exports rose by 2.9 per cent to US\$1.40 bn, while imports fell by 13 per cent to US\$1.05 bn to produce an increased trade surplus of US\$349 mn. Provisional figures for 1988 show a trade surplus of US\$280 mn (fob/cif), with exports of US\$1.45 bn and imports of US\$1.17 bn.

The country's endowment with mineral fuels has led to an imbalanced export structure. Despite the fall in export earnings because of lower prices and production, oil still accounted for 71 per cent of export earnings in 1986, although this was a reduction from the 92 per cent recorded in 1980. By 1988, however, its share had fallen to 57 per cent.

Imports are dominated by food, manufactured goods and machinery and transport equipment. Trinidad is heavily dependent on imported food, accounting for 40 per cent of all Caricom food imports. One element in the fall in imports in recent years has been the virtual cessation of imports of mineral fuels for processing and export since 1983, but the 42 per cent fall in the local currency value of imports between 1982 and 1986 was mainly due to the contraction of the economy and the imposition of import restrictions.

The majority of Trinidad & Tobago's trade continues to be with the U.S.A. Although a relatively small proportion of the total, trade with Caricom countries is of particular significance.

Trinidad had had a persistent surplus with other Caricom countries in recent years, due largely to petroleum product exports, and this has given rise to complaints from other Caricom countries, notably Barbados and St. Lucia. Trinidad & Tobago represents one of the most important regional economies and its restrictions against Caricom goods, temporarily imposed in 1985, have now been lifted, as part of a Caricom wide strategy of freeing up regional trade. In 1988 intra-regional Caricom trade increased by 10 per cent. 11.3 per cent of Trinidad & Tobago's exports went to Caricom in 1988 and its trade surplus with the region was TT\$388.5 mn.

Trend of external trade^a

(US\$ mn)

	1983	1984	1985	1986	1987	1988 ^b
Exports fob	2,026.5	2,110.8	2,110.7	1,363.1	1,402.4	1,453.3
Imports fob	-2,233.3	-1,704.9	-1,354.6	-1,209.4	-1,052.8	-1,172.7 ^c
Balance	-206.8	405.9	756.1	153.6	349.6	280.6 ^d

a Balance of payments basis. b Provisional. c Imports cif. d Fob/cif

Sources : IMF, International Financial Statistics; CSO

Main exports

(TT\$ mn)

	1983	1984	1985	1986	1987	1988
Mineral fuels	4,714.5	4,235.7	4,180.9	3,529.3	3,749.1	3,279.6
Chemicals	447.9	561.9	677.1	764.4	742.0	1,136.1
Manufactured goods	122.1	157.1	103.8	312.0	371.2	495.5
Machinery & transport equipment	9.5	5.1	4.6	12.8	71.7	398.2
Food (including sugar)	103.0	97.0	86.3	155.9	190.5	201.0
Total incl others	5,646.3	5,216.2	5,247.1	4,988.6	5,264.6	5,752.5

Source : CSO, *Review of the Economy*

Analysis of non-oil imports by economic end use

(TT\$ mn)

	1983	1984	1985	1986	1987 ^a	1988 ^a
Consumer goods	1,608.3	1,453.4	1,096.6	1,070.9	1,661.2	1,612.3
non-durable	1,009.1	939.6	807.9	810.0
semi-durable	289.2	252.3	149.0	128.4
durable	310.0	261.5	139.7	132.5
Intermediate goods	2,014.0	1,694.1	1,289.1	1,793.1)	1,030.2	1,169.9
Raw materials	335.0	368.6	255.7	347.1)		
Capital goods	1,923.5	1,064.6	989.4	1,559.6	1,029.0	936.6
Total	5,880.8	4,580.8	3,630.8	4,770.7	4,228.2^b	4,507.5^b

a Figures published by the Central Bank. b Totals include others

Source: CSO, *Review of the Economy*

Main trading partners

(% of total)

Exports to:	1986	1987	1988	Imports from:	1986	1987	1988
USA	60.8	56.5	57.8	USA	41.8	41.0	37.2
Caricom	9.4	10.6	11.3	Caricom	4.4	4.5	6.1
UK	4.9	3.1	2.6	UK	9.6	9.2	9.9
Other EC	9.5	8.8	4.5	Other EC	11.5	12.1	9.5

Source : CSO, *Review of the Economy*

Trade with Caricom countries

(TT\$ mn)

Exports to :	1987	1988	Imports from:	1987	1988
Jamaica	129.3	133.0	Jamaica	72.9	108.3
Guyana	24.6	38.4	Guyana	10.0	16.9
Barbados	163.6	187.0	Barabados	37.2	47.7
Others ^a	250.8	293.5	Others ^a	78.0	90.5
Total	568.3	651.9	Total	198.1	263.4

a includes St. Lucia, Grenada, Dominica, St. Kitts/Nevis/Anguilla, St Vincent, Belize

Source : CSO, Review of the Economy

EXTERNAL PAYMENTS AND DEBT

The trade deficits in 1982 and 1983 removed the cushion which since 1974 had normally resulted in a current account surplus despite a deficit on the services account. At the same time, a widening deficit on the services account started to appear, brought about by increased foreign travel expenditure and falling interest income from overseas, combined with rising interest payments on the external debt. Import controls imposed in 1983 were chiefly responsible for an improvement in the current account deficit from TT\$2,461.9 mn in 1983 to TT\$263.4 mn in 1985. However, the sharp fall in oil earnings in 1986 reversed this trend and led to a deficit of TT\$2,275.0 mn in 1986 and to a further drawdown of reserves. The improvement in the trade balance in 1987 continued into 1988. With little change in the overall services balance, the current account balance improved.

The large deficits of the last few years have been mainly financed by drawing on external reserves. Reserves at the end of 1987 amounted to TT\$207.0 mn. At the end of 1988 they were only TT\$142.2 mn. At the end of 1988 outstanding government external debt was estimated at US\$2,011.8 mn.

Balance of payments

(TT\$ mn)

	1984	1985	1986	1987	1988 ^a
Merchandise exports fob	5,055.1	5,159.8	4,887.7	5,028.8	5,586.3
Merchandise imports cif	4,593.2	3,729.9	5,274.5	4,228.2	4,507.5
Trade balance	461.9	1,429.9	-386.8	800.6	1,078.8
Services (net)	-1,528.6	-1,541.1	-1,751.1	-1,558.7	-1,514.2
Unrequited transfers (net)	-270.2	-151.4	-137.1	-132.4	-140.3
Balance on current account	-1,336.9	-263.4	-2,275.0	-890.5	-575.7
Direct investment	271.7	121.7	71.7	119.3	100.0
Other private investment	-411.8	-273.2	-314.7	-31.5	-20.0
Official borrowing	457.5	325.6	-261.6	-6.3	36.3
Official loans	-202.1	-158.6	52.2	115.7	104.8
Other	-175.9	312.2	520.0	-93.0	198.2
Balance on capital account	-60.6	327.7	67.6	104.2	419.3
Errors & omissions	-351.5	-325.9	-180.1	-129.6	-109.5
Overall surplus/deficit	-1,749.0	-261.6	-2,387.5	-915.9	-265.9
Counterpart items	-399.0	983.1	--	--	-45.0
Change in reserves (- indicates increase)	2,148.0	-721.5	2,387.5	915.9	310.9

Sources: Central Bank, *Annual Economic Survey*; CSO**International reserves**

(US\$ mn; end of period)

	1982	1983	1984	1985	1986	1987	1988
Gold ^a	24.7	20.6	16.6	13.1	16.4	19.2	16.8
SDRs	81.0	98.9	101.1	118.4	136.9	--	--
IMF reserve position	106.7	124.2	124.3	136.6	94.4	75.2	--
Foreign exchange	2,892.8	1,881.5	1,131.3	873.5	242.8	112.6	125.4
Total	3,105.2	2,125.2	1,373.3	1,141.6	490.5	207.0	142.2

a Year end holding valued at 75 per cent of fourth quarter London price.

Source : IMF, *International Financial Statistics***AID**

Trinidad's relative prosperity means that aid flows to it have been small. Assistance from the United Nations Development Programme accounts for over a third of total aid.

Total overseas development aid (gross)

(US\$ mn)

	1982	1983	1984	1985	1986	1987
Total	7.4	7.1	6.2	8.3	20.5	35.6
of which:						
bilateral	2.3	2.5	2.3	1.8	17.1	33.2
multilateral	5.0	4.5	3.9	6.5	3.4	2.4

Source : OECD, *Geographical Distribution of Financial Flows to Developing Countries*.

DEBT

Since the weakening of world oil prices in the early 1980s Trinidad has experienced a pronounced rise in its external debt; according to the World Bank the total debt outstanding at end 1987 was US\$1,635 mn. The most notable feature of Trinidad's rising debt profile has been the more than commensurate build-up of debt to foreign commercial banks, which rose by 154 per cent from 1986, to US\$1,135 mn in 1987.

Over the same period debt to both bilateral and multilateral sources has increased by just US\$121 mn to US\$ 384 mn. Although national data are recorded on a different basis to those of the World Bank, Trinidad's Central Bank indicated that by the end of November 1987, the country's debt burden had fallen marginally from the end of 1986 to the equivalent of US\$1,004 mn, as the government was repaying more than it could raise in new loans.

Between 1985 and 1987 external debt as a proportion of GDP averaged 18 per cent, compared with 8 per cent in 1977-82. By 1987 the external debt had grown to 26 per cent of GDP, 56.8 per cent of it denominated in US Dollars and 26.1 per cent in yen. The debt service ratio was 21.5 per cent at the end of 1988, compared with 24.2 per cent in 1987, thanks to the rescheduling arrangements made with banks.

The rescheduling arrangements were made with a six member Bank Advisory Group, representing 85 banks, and apply to loans totalling US\$460 mn falling due between September 1, 1988 and August 31, 1992. Repayment has been spread over twelve years after a four and a half year grace period. Interest will continue to be paid at Libor plus 15/16 per cent.

A rescheduling has also been completed with the Paris Club. It has agreed to restructure US\$160 mn of principal falling due between September 1, 1988 and February 28, 1990. Repayment has been

spread over seven years after a four and a half year grace period.

Interest payment terms are being negotiated with each country individually.

External debt

(\$ mn; end of period)

	1982	1983	1984	1985	1986	1987
Total external debt	1,203	1,438	1,222	1,448	1,858	1,801
Long term disbursed debt ^a	907	1,026	1,063	1,229	1,585	1,635
of which:						
multilateral	67	61	51	57	66	71
bilateral	308	289	314	310	327	313
suppliers' financial markets	531	676	698	932	1,192	1,251
Short term debt	296	412	159	149	273	166
Debt service	126	274	186	251	309	384
of which:						
principal	51	151	110	155	191	263
interest	75	122	75	96	118	121
Debt service ratio (%) ^b	4.0	10.6	7.2	9.7	17.8	---
Disbursed debt/ GNP (%)	11.2	13.1	13.9	17.6	33.0	39.3
Concessional loans share of disbursed public debt	3.9	3.2	2.8	2.3	3.0	5.4
Variable interest loans' share of disbursed public debt (%)	31.5	41.7	37.6	37.4	39.1	34.4

a Public and publicly guaranteed debt with a maturity of over one year. b Payments of interest and principal as a percentage of earnings from goods and services.

Source : World Bank, *World Debt Tables*

CURRENCY, TRADE AND INVESTMENT REGULATIONS

When the Trinidad & Tobago dollar was devalued from TT\$2.40 to TT\$3.60 to the US dollar in December 1985, the government rejected advice for a larger devaluation to TT\$4.00 or TT\$4.25 for fear of the social consequences, and maintained the TT\$2.40 rate for essential imports. This preferential rate was withdrawn in January 1987. In August 1988 the government devalued again this time, by 15.3 per cent, to TT\$4.25 = US\$1. The foreign exchange regime has been considerably eased since 1988. From January 1, 1989, petroleum service companies, selected tourist related

enterprises and manufacturers who are net earners of foreign exchange have been exempted from the allocation process.

Under the IMF agreement, the government is obliged to liberalise substantially the remaining restrictions on import payments before September 30, 1989, and to eliminate them altogether in 1990.

Exchange allocations for invisible payments above the limits delegated to the banks will continue to be authorised by the Central Bank. As part of its IMF programme, the government is also committed to reducing quantitative restrictions on imports (the "negative list") that compete with local manufactured goods. Negative list imports constitute about 28 per cent of total imports. By the end of 1989 about US\$150 mn worth of negative list imports will have been freed. A structural adjustment loan is being negotiated with the World Bank that will be used in part to help make local manufacturers more competitive.

Trinidad & Tobago is a signatory to the Lomé Convention, which allows duty free access to the ECC for industrial goods and most agricultural products, with a quota system for sugar, rum and other items. It is a beneficiary of the Caribbean Basin Initiative, which allows duty free entry to the USA for a wide range of goods.

The new government which took office in December 1986, has made vigorous overtures to foreign investors. The prime minister has been to North America, the UK and several other European countries seeking investment. A new Investment Code has been issued, which declares the government's preference for joint ventures as "the most desirable form of direct foreign investment". But wholly owned foreign enterprises in cases where there is substantial export content or a large number of jobs are being created, as in the Export Processing Zone (EPZ) at Point Lisas, will be allowed.

The government is also preparing legislation that would allow foreign investors to buy up to 20 per cent of the issued share capital of companies now quoted on the stock exchange, without the need to obtain an Aliens Landholding Licence. The Aliens Landholding Act is to be amended to facilitate this. A new Foreign Investment and Transfer of Technology Act is also under preparation.

ANNEX 2

**TERMS OF REFERENCE FOR A FEASIBILITY STUDY
FOR THE EXTENSION OF THE EXISTING UFC 85 UNIT**

**TERMS OF REFERENCE (T.O.R.) FOR A FEASIBILITY STUDY
ON THE EXPANSION OF THE EXISTING UREA FORMALDEHYDE
CONCENTRATE (UFC) 85% IN POINT LISAS (REPUBLIC OF TRINIDAD & TOBAGO)**

1. BACKGROUND

Trinidad & Tobago uses locally available important resources of natural gas to produce methanol as intermediate for formaldehyde. In 1986 in order to generate a further value added and in the same time to feed the local urea plant with coating materials for their slow-release urea fertilizers a UFC 85 production has been started up.

This unit has a yearly installed capacity of 12,000 tons UFC 85 and an actual production of which can attain approx 10,500 tons/year.

Presently, they are able to supply the urea plant, producing 520,000 tons/year of urea 46%, with 5,000 tons UFC 85 and the existing plywood factory with 4500-5000 tons utilized for the production of the urea-formaldehydic glues to be used in plywood binding; the glues production unit is integrated with the plywood plant.

The plywood plant is planned to be integrated also with a particle board production line in order to utilize wooden wastes: this new production line could need a quantity of 2000-3000 tons UFC 85 for their binders.

In the same time an expansion of the T&T urea capacity is envisaged, which could require an additional quantity of UFC 85 for coatings.

In order to grant their self-sufficiency in UFC production the Government of Trinidad & Tobago together with Unido is undertaking an expansion project for the UFC production unit: anyway the size of the new line has not been decided and a feasibility study is needed to investigate the financial and economic viability of various size options, as well as hypothesis of different production mix, for instance products with different concentration rates (UFC 65).

2. **OBJECTIVES**

A feasibility study is to be undertaken to investigate the commercial profitability and economic viability of the following options/hypothesis:

- 1 - Limited expansion of the UFC 85 plant in order to meet the increased demand from urea plants and from particle boards production line.
- 2 - Doubling of the existing UFC 85 capacity in order to grant full self-sufficiency of T&T, also in the case of further increase of the demand, deriving from nowadays unforecasted new ventures.
- 3 - Considering the hypothesis of reducing in the new additional line concentration of UFC down to 65%.

This study is expected to provide the Government and potential investor(s) with a rational decision making basis to choose from this options in UFC 85 production.

3. **SCOPE OF CONSULTANCY SERVICE**

A feasibility study will be undertaken in accordance with the UNIDO manual for feasibility studies on manufacturing. The outline of the study is as follows:

- Chapter I Executive Summary
 - II Project Background and History
 - III Study on the Production of UFC 85 or UFC 65
 - A. Market and Plant capacity
 - B. Material and Import
 - C. Location and site
 - D. Project Engineering
 - E. Plant Organization and Overhead Costs
 - F. Manpower
 - G. Project Implementation
 - H. Financial and Economic Evaluation
 - IV Conclusions and Recommendations

In undertaking the analyses specified in Chapters III, IV and V, the following aspects must be covered.

1. **MARKET STUDY**

1.1 Make projection for the likely growth in the local demand for each UFC downstream application for the coming 15 years. Indicate clearly all the assumptions made and sources of information used in forecasting the demand of each product.

1.2 Determine competitive ex-factory prices taking into account the existing international and domestic prices. Two sets of prices should be determined, one for the external market and other for potential internal transfer pricing. Each price set-up should be justified by details of the price build-up.

1.3 Investigate Government incentives and protection measures which influence the pricing of the proposed products.

1.4 Determine the most appropriate markets and distribution arrangement for product sold to the external market.

2. **PLANT CAPACITY**

On the basis of the demand projection, determine the plant capacity and specifically:

2.1 Select optimum initial and full capacity for production of UFC 85

2.2 State possibilities and provisions for further future expansion.

2.3 Determine a feasible production programme.

3. **RAW MATERIALS**

3.1 Determine the annual requirement of the major raw materials to produce each product at each stage

3.2 Indicate the quantities, specifications and sources of alternative raw materials. Particular emphasis must be given to determining the availability of indigenous raw materials which may be used as substitute raw materials in the future.

- 3.3 Investigate source of raw materials if additional raw materials other than those produced internationally would have to be procured to maintain an optimum level of production and explain if any particular nature of intermediates procurement such as import duties, etc.

4. **LOCATION AND SITE**

The present location and site seem to be suitable also for the expansion, but different options for different sites may be suggested, specifically:

- 4.1 List possible locations and describe them with respect to raw material and labor availability, proximity to market, infrastructure services, environmental considerations and any other additional relevant factors.
- 4.2 Make recommendations for the most suitable site within the recommended location indicating it on an appropriate map. State availability and estimated cost of the optimum site as well as additional requirements for transportation, utilities and other services and facilities.

5. **TECHNOLOGY AND PROJECT ENGINEERING**

The investigation will cover impacts of integrated operation, compare with separate production of different down-stream products manufacturing specifically:

- 5.1 Outline the process flow and describe the selected technology for each level of production. Justify the selection of comparing with other available forms of production for the same product, or alternative technologies.
- 5.2 List and specify the types and sizes of major machinery and equipment to be installed at each stage of production and justify the selection of the items.
- 5.3 Describe the functions performed by each major unit at each stage of production.
- 5.4 Specify auxiliary capital equipment and prepare a list of spare parts required for each production.

- 5.5 Specify the necessary maintenance and repair facilities in an integrated manner for each option. This investigation may cover some cost saving from the common facilities used for different stages of production.
- 5.6 Select the most feasible plant physical layout, stating the basis for the choice.
- 5.7 Prepare equipment layout drawings to scale for each production facility and auxiliary shops. State impact of integration vis-à-vis, the equipment layout and auxiliary shops e.g. whether auxiliary facilities can be reduced due to integration of different production facilities.
- 5.8 Prepare functional charts for process and material flow and draw energy balance diagramme for each production stage as well as in an integrated manner, if the integrated flow diagramme would differ substantively from the collection of the different down-stream production units.
- 5.9 Specify as much as possible building and other civil engineering work requirements for the project broken down into site preparation and development, building, storage facilities etc. State facilities commonly used for different downstream production units.
- 5.10 Provide brief site plan, if the site is finally determined for each option.
- 5.11 Estimate the power, fuel and other utility requirements for each stage of production unit as well as for the integrated three options.
- 5.12 Specify transportation facilities for raw materials and finished product and each stage of production.
- 5.13 Indicate the type and volume of effluents and the necessary treatment facilities before disposal (if applicable).

6. PLANT ORGANIZATION AND MANPOWER REQUIREMENTS

- 6.1 Propose an organization structure for the option, showing all line and staff relationships. Specify duties and responsibilities of each function.
- 6.2 Estimate total manpower requirements with breakdown of each unit of production as well as functional breakdown such as skilled, semi skilled, un-skilled, technical managerial, etc.

- 6.3 Work out training requirement for each production unit and specify minimum qualification required on the part of the trainees.
- 6.4 Indicate how and where the training should take place as well as its duration.
- 6.5 Identify technical assistance requirements of foreign experts; areas of specialization, duties, duration of assignments etc.

7. IMPLEMENTATION SCHEDULE

- 7.1 Work out a detail implementation schedule showing major activities of the project such as detail engineering, tendering, contracting, delivery, construction, erection etc., with the aid of appropriate bar chart.
- 7.2 Draw up manning programme for the project implementation period as well as for plant operation consistent with the implementation schedule.

8. FINANCIAL EVALUATION

- 8.1 Provide all investment cost estimates broken down into foreign and local components on annual basis.
- 8.2 Estimate the amount of working capital requirements, state specifically the criteria for its estimation.
- 8.3 Estimate production and operating cost. Provide also sales revenue for each year.
- 8.4 Prepare cash flow analysis for 15 years of project life.
- 8.5 Calculate internal rate of return on total capital and on equity, and net present value of project at 19% hurdle rate.
- 8.6 Prepare balance sheet, profit and loss account for 15 years.
- 8.7 Prepare table for source and application of funds.
- 8.8 Make a break-even analysis for production quantity

8.9 Undertake sensitivity and risk analysis.

8.10 Present suitable financial ratios

9. **ECONOMIC ANALYSIS**

9.1 Calculate the net present value using 15% discount rate as hurdle rate and the economic internal rate of return.

9.2 Estimate the total employment that the option will create. Indicate cost of labor wages paid to laborers.

9.3 Assess the impact of the project on the utilization of domestic resources.

9.4 Analyze the stimulus effect of the project on other economic activities.

9.5 Estimate foreign exchange saving/earnings.

9.6 Estimate other economic or social benefits that will be generated by the project.

9.7 Assess the effect of the project on the environment.

9.8 Compute the domestic resource cost to determine or evaluate the cost of manufacturing locally as against importing the same products.

Chapter VI must include a summary of conclusions and recommendations thereof. The report would select the most recommendable option out of the three and state clearly the reasons.

4. **GENERAL TIME REQUIREMENT**

The implementation schedule of this feasibility study compilation is as follows:

Award of Contract	A
Fielding of Consultants	A + 0.5
Completion of market, raw material	

Completion of technological investigation

A + 4.5

Compilation and submission of the draft final report

A + 5.5

UNIDO HQ will finalize the comment within 30 days after submission of the draft final report by the contractor. The final report will be submitted within 15 days after receipt of UNIDO comments.

5. **THE REPORT**

Twenty (20) copies of the final report compiled in English will be submitted by the contractor to UNIDO.

ANNEX 3

LIST OF CONTACTS

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- Deane Jordan, Acting Manager Industry & Energy Operations Division - World Bank - Washington D.C.
- Patrick Bagget, Executive Vice President - C.M.A.I. - Houston/Texas
- Jim Clark - Joe Camili Ass. - Dallas/Texas
- Eugene Debreczeni, Man. Director - E.D.A. - Conroe/Texas
- Vanessa Holm - C.I.B.C. - Houston/Texas
- Nello Raphael, Economic Adviser to the Prime Minister - Port of Spain (T & T)
- Kay Rudder - T.C.U. - Port of Spain (T & T)
- Mary King, Chairman - T & T Urea Co. Ltd. - Point Lisas (T & T)
- George de Verteuil, Manager Corp. Planning - Trintoc - Pointe-a-Pierre (T & T)
- Errol Baldeo, Analyst Corp. Planning - Trintoc - Pointe-a-Pierre (T & T)
- Kelwin Harnanan, Senior Analyst, Corp. Planning - Trintoc - Pointe-a-Pierre (T & T)
- Michael Romany, Managing Director - Handy Equipment Co. Ltd. - Port of Spain (T & T)
- Leslie Lucky - Samaroo - Chairman - Caribbean Plywood Co. Ltd. - Port of Spain (T & T)
- Ben Runveldt - Southern Electric Ltd. - Port of Spain (T & T)
- Ammed Sirfoss - Tanteak - Port of Spain (T & T)
- T & T Electricity Commission - Port of Spain (T & T)
- Williams Foundry - Port of Spain (T & T)
- Neal & Massey - Port of Spain (T & T)
- M & L Dolloway - Sawmills - Port of Spain (T & T)
- Ramsamai Panels - Port of Spain (T & T)
- National Manufacturing Ass. - Georgetown - Guyana
- Chamber of Commerce - Georgetown - Guyana
- Smurfit Carton de Venezuela - Georgetown - Guyana
- Guyana Sawmills Ltd. - Georgetown - Guyana
- Kim Kissoon, Chairman - Plywood Industries Ltd. - Georgetown - Guyana
- George Persand - Toolsie & Persand Co. Ltd. - Georgetown - Guyana
- John Ross - Jamaica Packaging Industries Ltd. - Kingston - Jamaica
- Anjoda Kalim - Konventra - Kingston - Jamaica

- Lewis Andrews - Paper Processors - Kingston - Jamaica
- Kay Martin - West Indies Pulp & Paper - Kingston - Jamaica
- Frank Vandersande - Maico International - Portorico
- Building & Construction Association - Miami - Florida
- Dr. Carlo Pastonesi, Marketing Manager - SIR/Deutschland - Frankfurt-Germany
- Helmut Rathmann - Deutsche Bakelite - Frankfurt - Germany
- Luigi Frigerio - Sirlite - Milan - Italy
- Dr. Angelo Speranza, General Manager - C.A.T.A.S. - S. Giovanni Natisone - Italy
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