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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

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FEASIBILITY OF ESTABLISHING A MATCH INDUSTRY*

WESTERN SAMOA
IS/WES/75/003

Mission report

by

S. Ramachandran, expert in the production of matches

Prepared for the Government of Western Samoa on behalf of the
United Nations Industrial Development Organization,
executing agency for the United Nations Development Programme

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1. Evaluation and Recommendations

The basic considerations in determining the feasibility of establishing a Match Industry in Western Samoa are:

(a) Availability of good quality soft wood, suitable for production of Match Splints and boxes in adequate quantities, at reasonable prices and assurance of uninterrupted regular supplies to the factory.

(b) Although total consumption of Matches in the Country is limited by the low population, it is certainly possible to put up a Match factory, organised on cottage basis initially, with minimum mechanisation of operations, employing manual labour largely. Intelligent young men and women are required to operate the factory and formal education is not important or necessary.

(c) Fair price in the market for matches produced. Government should clamp down on imports as soon as local production is of acceptable quality and adequate for the market.

(d) Existence of infrastructure including power, water services, harbour facilities, marketing organisation and channels for developing exports of Matches and Splints to other islands in the South Pacific.

Conditions in Western Samoa are quite favourable in respect of most of the above considerations and consequently, establishment of a Match factory is recommended, for implementation in two phases as outlined below:

Phase I 1976/78 - Production envisaged 3-5 million boxes each of 50 sticks, annually.

Mechanical operations will be -

Cross cutting of logs by chainsaw,
Peeling of Box and splint veneers,
Chopping of Box and splint veneers,
Inner and Outer Box Making,
Frame filling of splints,
Discharge of sticks from frames.

All other operations will be executed manually.

A small mechanical workshop will be organised for grinding knives, doing minor sheet metal work, welding, etc. A good carpentry shop will be organised to produce frames, trays, racks, containers and factory furniture locally. Prototypes for frames and trays will be provided by the expatriate technicians when they arrive for giving intensive training to local personnel in Industrial production of Safety Matches and Quality Control, like operating Simple Match machinery, indoctrination in quality standards for local and export markets. Local personnel will be trained to become good Industrial workers.

Capital investment in Machinery, Buildings, services and working Capital initially for 3 months will be in the region of U.S.$218,000.00.

Phase II 1978/80 Production will be stepped up to 10-20 million boxes/year. depending on export orders.

Additional mechanisation of operations will be effected as follows:

- Splints Drying
- Splints Polishing
- Splints Cleaning
- Splints Sieving
- Pneumatic transport in between above operation and to bins
- Boxes Drying
- Frame dipping in Paraffin and Chemicals
- Side Coating of boxes

Additional capacity will be installed in:

- Inner and Outer Box making
- Frame filling,
- Discharge from frames

to meet the augmented production. Either a small packaged Boiler or Gas heating device will be installed for mechanical drying of boxes and splints. Additional capital required will be approx. US$116,000.00.

Implementation of Phase I will require the services of an Expatriate experienced Engineer who will manage the factory for a period of 4-6 months and 3 Expatriate Technicians for a year.

Implementation of Phase II will require the services of an expatriate Engineer for 2 years and 3 technicians for the same period. During this period Local Personnel will be trained to take over the functions progressively and will manage the plant entirely by the end of the 2 year period.

Apia will be the ideal location since service costs can be kept down. Mamalava timber is available in plenty in Upolu Island and matches will be consumed mostly here.

A match factory, even a small production unit, can be operated on a profitable basis. So implementation of Phase I of the project is a fairly simple proposition. The production costs have been worked out over 5 million boxes/year which allows for export of 2 million boxes. Actual retail prices in the market vary between 3 sene to 5 sene per box. Prices can be reduced substantially at the end of Phase II.

In the analysis of costs, an attempt has been made to optimise profits at the low level of production by adjusting levels of mechanisation. Reducing the mechanical component by increasing the manual component, would increase unit cost, since making inner and outer boxes manually is excessively labour consuming. On the other hand, at higher levels of mechanisation, Investments will be higher and consequently overheads, and this would again put up unit cost, in view of the distribution over a low production. Therefore levels of mechanisation recommended are critical and optimum.

A critical evaluation of the project demands examination of some uncertain factors, especially prospects of export of Matches and Splints.

As explained earlier, the export potential is good. With the timber quality and prices in Western Samoa, the prospect is very promising indeed. It is certainly possible to produce excellent quality matches and compete in export markets on price and quality. World prices of splints has doubled over the last 6-8 years. Until vital information is compiled and the export markets are studied in depth, Phase II of the project should not be launched. Fiji produces Matches generally of poor to average quality, consumes 70% of the production and exports 30% to Tonga, Samoa and other places. Western Samoa can certainly produce much better matches but only 30% will be locally consumed. 70% will have to be exported. It is necessary for a specialist representative to visit all the Islands in South Pacific, New Zealand and some of the middle Eastern Countries to study and assess the markets for matches and splints, collect information on demand, competitors' prices and quality, establish useful marketing channels and contacts, and if possible secure commitments to buy from Western Samoa, under guarantees of conformance to Consumers' specifications. This may be completed in a period of 3 months possibly. In Phase II, 12,000 million splints, value over half a million U.S. Dollars, will be available for export annually. If a decision is taken to go ahead with the project, say by June this year, the following time schedule for action is suggested: Building and Services lay out to be prepared by end of July 1976; Buildings and Services to be completed by November 1976. Machinery may be ordered in July/August. Delivery time is usually 4 to 6 months. So they will arrive on site in November and erection completed in December.

Expatriate Engineer and Technicians to be recruited by September to join in November 1976.

Production will commence on small scale in January 1977 and will reach normal level by April 1977.

2. Introduction

The writer has been retained by the United Nations Industrial Development Organisation to make this study at the request of the Government of Western Samoa.

At present Matches are imported into Western Samoa from countries as far away as Sweden. Evidently the proposal to establish a Match Industry is intended as an import substitution venture, particularly in view of the rich forest resources of Western Samoa and assurance of adequate supplies of suitable quality soft timber for matches production. Since timber is an important component in the cost of production of matches, it is only logical that indigenous resources should be utilised for the purpose.

Further, in spite of the low total consumption of matches in the country, it would appear that existing market prices would amply justify the establishment of a profitable match factory locally. A match box is retailed at between 3 and 5 sene each or 4 to 6½ U.S. cents per box, very high prices compared to other developing countries. In India matches are retailed between 1½ to 1¾ U.S. cents per box.

Generally a match factory is always an extremely profitable proposition. It need not be capital intensive. Partly to reduce labour costs in Developed Countries of the West, the manufacturing of matches has now been developed to the point where it is a continuous mechanical operation requiring comparatively little labour. Middle East Countries like Egypt and Algeria import timber logs over long distances from Sweden, Finland Russia at prices almost 3 to 4 times the price of local Western Samoan timber, to process them to matches for local markets and in some cases even for export of small quantities matches as done by Egypt. Countries like Iraq, Syria, Libya, Lebanon and sometimes Egypt and Algeria import ready impregnated splints from Finland, Sweden, Russia and China at prices around US.40-45 per million splints for processing to Matches for their local markets.

The Match Industry started as a labour-intensive one at the turn of the Century. But over the years, the operations involved in Matches production have been progressively mechanised partly to minimise labour costs and mainly with a view to meet the large quantitative demands by installation of high speed machinery and rationalisation. It has become quite capital-intensive, requiring technical expertise of a very high order and demanding highly qualified and skilled operating personnel.

But in India with its unemployment problems and in developing countries like Indonesia and Nepal with similar problems of unemployment and acute shortage of skilled labour, the Match Industry continues to be labour intensive. Over 60% of India's demand i.e. roughly 6,500 million boxes are produced annually by cottage factories in units producing as low as 25 gross boxes/day to 1,000 gross/day. Western Samoa's demand of 3 million boxes/year is equivalent to a production of 70 gross/day. The cottage factories employ minimum mechanisation and the matches are mostly hand made. The quality of matches produced is just as good as, and often superior to, machine produced matches.

In Europe, only 2 varieties of timber are used for Match splints production, Aspen and Poplar. The boxes are invariably produced out of cardboard, to permit operation of high speed machines. The waste is quite low with cardboard and additional economies are realised by printing the trade label on the outer box cardboard itself and also saving of wrapping paper on the inner and outer boxes. With wooden boxes wrapping paper and printed labels will be necessary. But with favourable prices of timber and abundance of supplies existing in Western Samoa. Cardboard boxes do not make sense, except when they are preferred for export markets.

In tropical countries, many different varieties of timber with differing physical characteristics like , moisture content, shrinkage, texture, movement, colour etc., are employed in production of splints. Colour of splints is an irrelevant quality consideration in domestic markets. It is always possible to colour the splints by dyeing in suitable colours and stick contrasting colours in match heads, if necessary. There are good white timbers suitable for splints in Western Samoa. Only in the initial phases, sun drying will be resorted to and that would impart a brown colour to the splints. This would be eliminated in later phases after installation of Mechanical driers.

Among all the Islands in South Pacific, only Fiji has a Match factory near Suva, producing roughly 23 million boxes annually of which, 16 million are consumed locally and 7 million are exported to Tonga, Western Samoa and other islands. The per-capita consumption of Matches is about 45 boxes of 50 sticks each annually in European countries, 21 boxes in India and 19 boxes in Western Samoa. Consumption in Western Samoa has increased from 2.24 million boxes in 1969 to about 3 million in 1975, an increase of 34% over 6 years. Therefore the suggestion made by the Director of Agriculture that the proposed Western Samoan venture should be designed to cater to a population of 500,000, which obviously includes an export component, is pragmatic. So the ultimate production at the end of the second phase would be 10-20 million boxes annually. It must be emphasised that consumption of matches is naturally related to the standards of living as well, besides population increase.

The Fiji factory has been operating for many years, utilising local "kau vula" timber for splints. Imported cardboard skillets from New Zealand, printed and ready cut for outer boxes and punched out for inner boxes are used. The Manager of the Fiji factory mentioned that he found the "kau vula" timber somewhat hard on peeling. A good percentage of cross grained splints could also be observed. Here, in Western Samoa, three species of timber have been distinctly identified by the writer as quite suitable for Matches production. They are, in order of preference, Planchonella Torricellensis (Mamalava), Canarium Samoansis (Ma'ali) and Dacoxylum Samoense (Mamala). Ceiba pentandara (kapok) has to be tested before a definite opinion can be given. Other species that look very promising are Pometia pinnata (Tava) and Casu. Of these "Mamalava" is the best and ideally suited for production of Splints and Box veneers. It is available in abundance in Upolu Island as well as Savai'i. In Upolu it constitutes roughly 33% by numbers and 30% by volume in the forests according to the forest department inventory and is the highest among all the species. "Mamala" comes next with 21% by numbers and 19% by volume. The forest department assures that regular supplies to be in requirements of the Match factory could be easily arranged from Upolu Island itself for the foreseeable future.

With a dynamic marketing organisation, export potential of Matches to other South Pacific Islands could be fully utilised. Export markets even as far as Middle East countries for splints could be usefully investigated if good quality impregnated and polished splints, dried in mechanical driers, cleaned, sieved and compactly packed in moisture sealed cartons, are produced. New Zealand is another attractive market. New Zealand buys ready splints from Australia where soft timbers from Papua New Guinea are processed for domestic consumption and export to New Zealand. Based solely on ruling prices of timber in Western Samoa as against Europe, the prospect of exporting splints at favourable competitive price looks bright and deserves investigation in depth.

Such a study could be carried out by an Expert for a 3 months assignment as part of a UNDP or UNIDO financed project. The duties of this expert and his tentative work programme are given in Annex I.

The following table gives an indication of possible markets for Match export.

Island	1975 Population Projected from 1972 figure	Growth		Markets (Possible annual consumption based on per capita figure of 24 boxes each of 50 sticks)
		Population	GNP	
Western Samoa	165,000	2.3%	0.4%	4.1 million
British Solomons	193,000	2.7%	0.4%	4.8 million
French Polynesia	147,000	4.4%	0.4%	3.7 million
New Caledonia	131,000	3.5%	5.3%	3.3 million
Trust Territory of the Pacific Islands	129,000	3.2%	2.9%	3.2 million
Tonga	105,000	3.1%	2.0%	2.6 million
New Hebrides	98,000	2.6%	1.6%	2.5 million
Gilbert & Ellice Islands	67,000	2.2%	0.5%	1.7 million
American Samoa	36,000	3.7%	5.0%	0.9 million
		Total :		26.8 million

(Figures of Populations and Growth are taken from U.N.Publications)

The Topography of Upolu and Savai'i islands facilitates round the year logging operations in the forests. This would enable the factory to operate with low inventories and reduce, if not eliminate, expenditure on protection of timber from Algae and insect attack.

3. Production Capacity

(a) Production Process:

Safety Match Production comprises a number of operations. These operations are specified below in right sequence as mechanically or manually executed for the Western Samoa factory under Phase I.

	Mechanical	Manual
1. Debarking		x
2. Cross cutting to bolts or billets with portable electrically driven chain saw	x	
3. Transport and loading of billets		x
4. Peeling of billets to splints and boxes veneers	x	
5. Sorting and arranging of veneers		x

	Mechanical	Manual
6. Chopping of Veneers to splints and Box skillets	x	
7. Dyeing of outer box veneer in red colour		x
8. Cutting of Blue wrapping paper		x
9. Making paste		x
10. Making outer boxes	x	(Boxes dried in the sun)
11. Making Inner Boxes	x	
12. Transporting inner and outer boxes to bins		x
13. Impregnating splints		x
14. Drying splints in the sun		x
15. Transporting splints to bins		x
16. Loading splints into frames	x	
17. Dipping in Paraffin		x
18. Dipping in chemical		x
19. Drying of sticks in Air		x
20. Discharging sticks from frames levelled into trays	x	
21. Filling sticks with boxes		x
22. Coating box sides with chemical composition and drying		x
23. Packing boxes into 10's or dozens		x
24. Internal transport of boxes and splints		x
25. Making chemical composition for match head in grinder	x	
26. Making Chemical composition for side coating in Ball Mill	x	
27. Transport of chemicals and mixing		x
28. Storage, cleaning and sundry operations		x

In Phase II, operations 13, 14, 15, and 22 will be mechanised. Besides splints will be put through certain additional mechanical operations like polishing, cleaning and sieving, not included in the list of operations specified above.

(b) Raw Materials:

Timber is the major raw material. Roughly 8,000 cu. ft. will be required annually, equal to extraction from 8 to 10 acres, for a production of 5 million boxes, adequate for domestic consumption. This supply could be maintained effortlessly. This will increase to 15-16,000 cu. ft. annually in 3 years time when production will rise to 10 million boxes, considering present timber extraction from the forests for the sawmills, this figure is insignificant. A price of WS$50/per 100 cu.ft.

equal to US$67/ex-factory has been suggested as stable for some years to come. The actual figure is somewhat lower at present. Potassium Chlorate, Zinc Oxide, Sulphur, Animal Hide Glue, Red Phosphorus, Synthetic Glue, Antimony Sulphide and dyestuffs for colouring heads, splints, boxes will have to be imported. The quantities involved are comparatively low and so 4 years requirements can be imported at a time. Suitable indigenous materials like starch, kieselguhr and silica or quartz powder in place of glass powder are possibly available in Samoa.

Blue Match Paper, Label Paper and Packing Paper will need to be imported. These again are in small quantities and annual requirements could be imported at a time. Labels could be printed locally in the local Printing press.

(c) Buildings, Machinery and Equipment:

The factory requires about 10,000 sq. ft. covered space and about an acre of land for storing logs, drying splints, boxes, etc. If short spurts of rain occur every day, it may be necessary to have an additional 10,000 sq. ft. covered shed for drying of splints and boxes. But in Indonesia where conditions are almost identical, cemented floors slightly raised from ground level are used for drying and waterproof Tarpaulins employed to cover the material during spurts of rain.

In Phase I the following machines will have to be imported:

	Prices include spares for 2 years and are specified in U.S. Dollars
Electrically driven Portable Chain Saw - 1	3,000.00
Knife grinder (Japanese) - 1	5,000.00
Lancet grinder (Japanese) - 1	2,000.00
Inner Box Making machine - 1	12,000.00
Outer Box Making machine - 1	7,000.00
Frame filling machine - 1	2,000.00
Frame Discharging machine - 1	2,000.00
Ball Mill for side coating - 1	2,500.00
Chemical composition conical grinder for head composition - 1	6,000.00
Chemical Mixer - 1	2,000.00
Laboratory equipment for testing - 1	4,000.00

Workshop and Carpentry Shop, Tools and Equipment	US$10,000.00
Locally fabricated paraffin and chemical dipping tables, frames, trays, racks, containers and factory furniture	US$ 5,000.00
Total:	US$121,500.00

In Phase II the following additional machines have to be procured:

		U.S. Dollars
Splints Drier (Japanese)	- 1	30,000.00
Polishing Drum (Japanese)	- 1	8,000.00
Cleaning Machine (Japanese)	- 1	3,000.00
Sieving Machine (Japanese)	- 1	6,000.00
Side Coating Machine (Japanese)	- 1	8,000.00
*Outer box making machine (Japanese)	- 1	7,000.00
*Inner box making machine (Japanese)	- 2	24,000.00
Spill sticks levelling machine	- 1	5,000.00
**(Small Steam boiler, Fire tube Lancashire type (Capacity 1,000-1,500 lbs/hour at at 100 lbs/sq. in. pressure (Using waste wood fuel (Including steam pipes, condensate pipes, steam trapping etc. (or Gas heater for Air		25,000.00
Total:		116,000.00

Technical specifications for this equipment as well as a list of manufacturers is given in Annex II.

*These machines can be eliminated by operating 2 shifts of 8 hours each. They are necessary to meet additional production capacity.

**This price is estimated and could be considerably lower. Alternatively second hand equipment could be procured at cheap prices and will be adequate for 10 years.

Personnel required, level of education and training:

Manager of Factory - 1	University education preferable. Some knowledge of accounting, Public relations essential.
Accounts Assistant - 1	High School Education, knowledge of Bookkeeping, Timekeeping and Stores essential.
Sales Assistant - 1	High school education with some experience of marketing, credit control, etc.
Clerks - 2	Basic Secondary School Education.
Supervisors - 3	Formal education unnecessary but they should have the personality to control workers with firmness and sympathy and to be able to get along with them. They will be trained in production and quality control.
Skilled workers (men) - Grade I - 4	Some experience of operating machinery and doing repairs and adjustments to machines. They will be trained on the job. No formal education necessary. This includes: 1 Welder 1 Fitter cum Turner 1 Carpenter
Grade II - 2	Should be intelligent, capable of being trained as Craftsman Grade I.
Semi-skilled workers - 4	They will be initially recruited as unskilled workers and gradually upgraded to semi-skilled category after training. Should have the intelligence to pick up skills by working with skilled workers.
	No formal education necessary. Will be trained on the job.
Un-skilled workers - 14	Alertness, diligence and basic intelligence adequate, will be trained on the job.
1 Pick-up Driver - 1	
Sundry Staff - 2	

SALARIES AND WAGES FOR FACTORY EMPLOYMENT

(5 million boxes per year)

	U.S. Dollars	
	Per Month	Per Year
1- Manager	500	6,000
1- Accounts Assistant	333	3,996
1- Sales Assistant	200	2,400
2- Clerks	240	2,880
3- Supervisors	360	4,320
1- Pickup Truck Operator	80	960
2- Sundry Staff	134	1,608
4- Skilled workers (Grade I)	600	7,200
2- Skilled workers (Grade II)	220	2,640
4- Semiskilled workers	340	4,080
14- Unskilled workers	938	11,256
Total Samoan :	3,945	47,340

Expatriate (During 1st year of Operation)

1- Manager-Engineer	1,400	8,400 (6months)
3- Technicians	2,400	28,800 (4months)
Total Expatriate :	3,800	37,200

In Phase II when Production is doubled the workers required will be:

Grade I	- 4
Grade II	- 4
Semiskilled	- 12
Unskilled	- 24

(e) Utilities:

Total connected load will be about 35 kw initially and will rise to a maximum of 60 kw by the end of Phase II.

Present installed capacity of the Power Station in Apia is about 6.5 mw and will be increased to 7.98 mw in 1977, 9.48 mw in 1978 10.48mw in 1979. 10.3% growth in Power consumption annually has been planned and the Match factory's demand can be easily met.

Since the factory is planned on cottage basis initially, no expensive fire protection system is called for. Fires could be easily localised and portable foam type fire extinguishers would be adequate. Office, social facilities, roads, sewerage, fencing and other contingencies can be provided by locating the factory near the existing saw mill of New Samoa Industries Limited, in the Industrial Free Zone. No serious problems can be visualised.

4. Investment and Production Costs:

		U.S.Dollars
Main factory building (100'x100') including Stores for chemicals, Finished matches, Potassium Chlorate, Spare parts and tools with power laid out	@ US$7.00/sq.ft.	70,000.00
Machinery and tools		121,500.00
Car and Pick-up		8,000.00
Furniture and fittings		2,000.00
Current assets - Chemicals, paper for 1 year Timber for 2 months		5,000.00
Pre-production expenditure including Salary for expatriate Manager and 3 technicians for 3 months		11,400.00
	Total :	218,000.00

Cost of Production:

Production	5 million boxes year	10 million boxes/ year
Machinery utilisation	50%	80%
	U.S.Dollars	U.S. Dollars
Raw Materials:		
Timber 8,000 cu.ft. @ US$67.00 per 100 cu.ft	5,360.00	10,720.00
Chemicals, paper, labels,etc.	1,100.00	2,200.00
Salaries and Wages	47,340.00	76,000.00
Overheads:		
Power @ US$0.08/kwh	5,800.00	14,000.00
Maintenance at 3% Machinery Cost	3,650.00	7,130.00
Depreciation @ 2% on buildings	1,400.00	1,400.00
12½% on Machinery	15,200.00	29,690.00
25% on Vehicles	2,000.00	2,000.00
25% on furniture and fittings	500.00	500.00
Office, Insurance, Sales, Sundries like Travel, Carriage inwards, etc.	2,500.00	5,000.00
Total :	84,850.00	148,640.00

Revenue and Net Income on Sale of Five Million Boxes of Matches

Retail Sales = 5 million boxes @ 4 sene each		WS$ 200,000.00 1/
Less Retailer's Margin (20% of retail price)	(-)	WS$ 40,000.00
Less Wholesaler's Margin (7% of retail price)	(-)	WS$ 14,000.00
Net Income to Match Company before Excise Tax :		WS$ 146,000.00
Less Excise Tax (60sene per gross or 144 boxes) :	(-)	WS$ 20,800.00
Net Income to Match Company after Excise Tax :		WS$ 125,200.00 (US$ 167,000.00)

1/ Assuming a retail price in Western Samoa of 4 sene per box.

Profitability of the Match Company:

Five Million Boxes a Year Production Rate

	U.S. Dollars	
	1st Year	Subsequent Years
Net income before excise duty deduction	195,000	195,000
Cost of Production	123,000	85,000
Gross Profit:	72,000	110,000
Excise Duty	28,000	28,000
Net Profit before Income Taxes :	44,000	82,000

Average annual net profit before income taxes (during the first 5 years of operation) = US$74,000.00

Average annual return on investment before taxes (during the first 5 years of operation) = 33.8%

($74,000.00/$218,000.00)

Phase I - SAMOAN SALARIES AND WAGES - SUMMARY

Salary per Month - U.S. Dollars

	Per Person		Number of Persons		Total
Manager	500		1		500
Accounts Assistant	333⅓		1		333
Sales Assistant	200		1		200
Clerk	120	x	2	=	240
Supervisor	120	x	3	=	360
Pick-up Driver	80				80
Sundry Staff	67	x	2	=	134
Skilled - I	150	x	4	=	600
Skilled - II	110	x	2	=	220
Semiskilled	85	x	4	=	340
Unskilled	67	x	14	=	938
					3,945 x 12
					=47,340/year

Annex I

Draft Job Description for an Expert in Match Production

Title:	Expert in Match Production
Duration:	3 months
Date Required:	
Duty Station:	Middle East (3 weeks) South Pacific (8 weeks) Appia (1 week)
Purpose of the Project:	To make a logistic study of potential markets for Match Splints in the Middle East countries of Egypt, Syria, Iraq, Yemen and in Algeria, Indonesia and New Zealand, and for Safety Matches in the South Pacific Islands of Tonga, American Samoa, Solomon, Gilbert and Ellice, New Hebrides, New Caledonia, French Polynesia and Trust Territory of the Pacific Islands.
Duties of Expert:	The expert will undertake this study in two distinct steps:

1. He will spend 3 weeks visiting Match factories in Algeria, Egypt, Syria, Iraq, Yemen and Indonesia and collect data about specifications and standards of splints used in these factories, the quantities imported annually, sources and prices.
   He will ascertain willingness of the factory managements to accept splints from Western Samoa subject to conformance to specifications and standards.
2. He will spend 8 weeks altogether in all the South Pacific Islands and
   (a) collect demand statistics for matches in as much detail as possible. To make a data base the following studies should be made and analysed -
   Names and location of customers or potential customers,
   whether import and marketing of matches are done by traditional wholesalers or by large mass retailers as in Western Samoa,
   the brands and types of matches imported and the form and varieties of packages,
   origin and import prices of these matches,
   what customers buy what volumes and in what time periods,

Annex I (page 2)

(b) prepare estimates of costs involved in freight, insurance, special packing requirements, etc. for each of the geographic locations and establish c.i.f. prices for matches from Western Samoa. These should be correlated with existing import prices in the different islands and profitability should be studied.

(c) Make a study of customers by field interviews and try to establish their willingness to accept matches from Western Samoa.

The Expert will spend a week preparing the final report.

Qualifications: Engineer or match production specialist with long experience in the production and marketing of match splints and matches for export. Experience in developing countries desirable.

Language: English

Background Information: UNIDO has provided assistance to the Government of Western Samoa in the preparation of a feasibility study for a match industry.

The report of that one-month mission recommended the production of matches for the local market by labour intensive methods.

It also identified the potential of producing splints for countries that presently import their needs; and matches for the South Pacific region.

This market survey is a follow up to the above assistance.

Annex II - Specification of Equipment for a Match Factory

Machine	Specifications	No. required
1. Splint Veneer Peeling M/c	to take max. diameter billet 850 mms, width of billet 450 mms. capacity about 2 million Splints/hour	1
2. Splint Chopping M/c	fitted with Splint Veneers carrier, capacity about 2 million Splints/hour	1
3. Box Veneer Chopping M/c	fitted with Veneers carrier, capacity about 90000 pieces each of inner, outer and bottom skillets.	1
4. Frame Filling M/c	capacity not less than 20000 boxes of 50 sticks each in 8 hours.	1
5. Frame discharge M/c	of capacity adequate to discharge the output of Frame filling machine.	1
6. Inner Box making M/c	capacity 100 boxes/minute(Wooden boxes)	1
7. Outer box making M/c	capacity 125 boxes/minute(Wooden boxes)	1
8. Knife grinder	suitable for Peeling and chopping knives	1
9. Lancet grinder	for grinding scoring, cutting and grooving lancets	1
10. Ball mill for side coating chemical composition	with balls of cast iron 50,60 and 80mms diameter.	1
11. Chemical mixer and homogeniser	High speed turbo mixer type	1
12. Conical Chemical grinder for Match head composition	for fine grinding of chemicals	1
13. Portable Chain Saw	for cross cutting logs	1
14. Splints filling frames	with bars and clips	200
15. Splints trays carrier	for arranged sticks	4
16. Splints trays	of aluminium	30 sets
17. Hot air blower for Match heads		1

Spare parts adequate for 2 years operation for all the above machines will be required.

Suppliers of Machinery :

1. ARENCO AB, Box 212, S-381 01 Kalmar 1, Sweden
2. Rollergeschaftsfuhrung Gmbh, Prinzenallee 24, 1 West Berlin 65, West Germany.

The above makers produce only items 1,2,3,6,7,8,9,10 and 11 only.

3. Hanshin Shaving Co. Ltd., 10-6 Minami Sakae-Machi, Arai, Takasago city, HYOGO PREF., Japan.

This maker produces all the items mentioned above.

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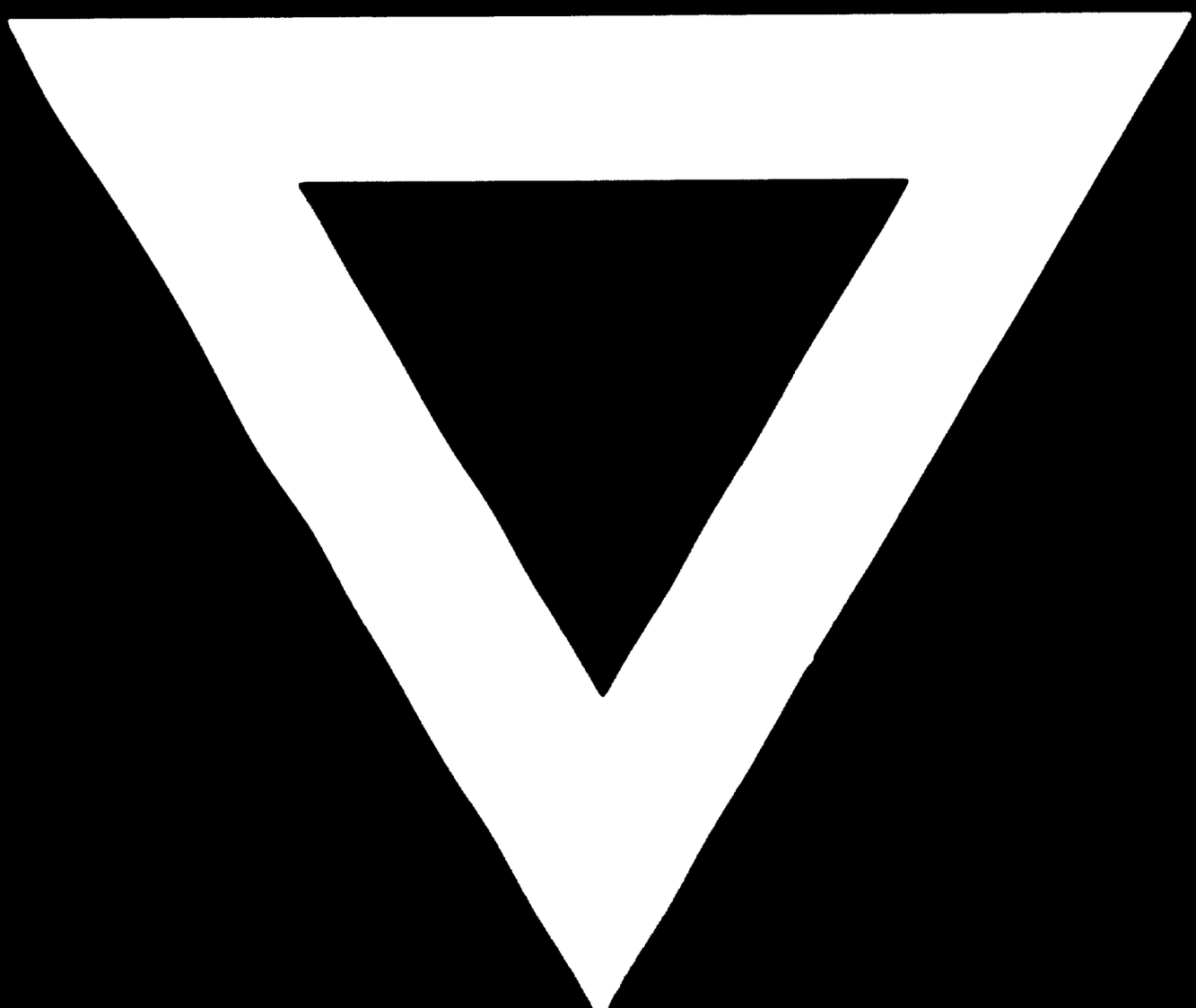

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