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FINAL

TECHNO-ECONOMIC INVESTMENT PROFILE
ON

V-BELTS FOR AUTOMOTIVE REPLACEMENT MARKET

prepared for

THE GULF ORGANIZATION FOR INDUSTRIAL CONSULTING

22

Industrial Investment Division
Vienna, February 1991

TECHNO-ECONOMIC INVESTMENT PROFILE

ON

V-BELTS FOR AUTOMOTIVE REPLACEMENT MARKET

1.0 EXECUTIVE SUMMARY

The term 'V-Belts' includes standard V-section belts, and a wide range of non-V-section belts which are tailored to individual engine designs. It is recommended that any initial project be restricted to standard V-section belts.

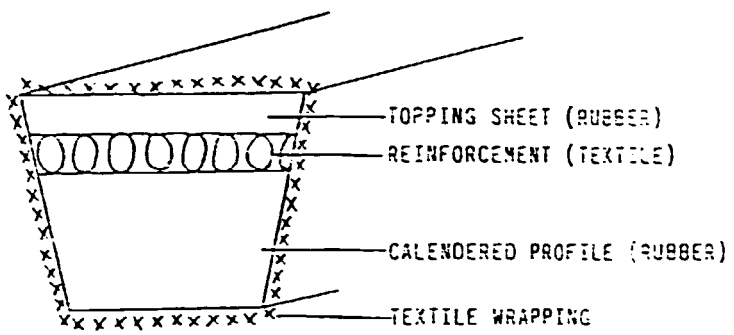
An annual production level of 396,000 belts is initially recommended, representing an annual turnover of US $1,220,000. The projected return would be US $365,000 gross profit. Additional sales of V-belts for the general non-automotive market would also be feasible.

The investment in machines, installation, commissioning and know-how fee is estimated at US $1,025,000 plus site, building and local costs.

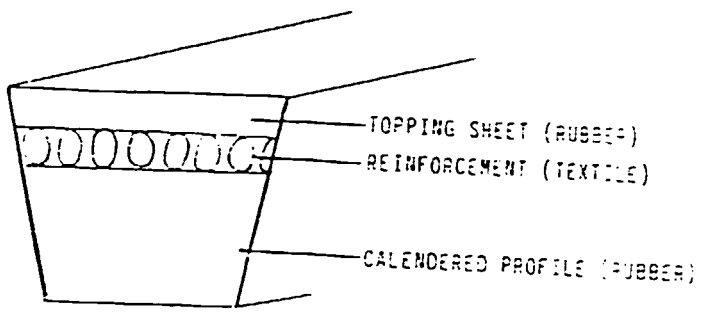
2.0 PRODUCT DEFINITION

There are three basic types of V-Belts in general use including automotive applications. The cross-sections of these basic types are as follows:

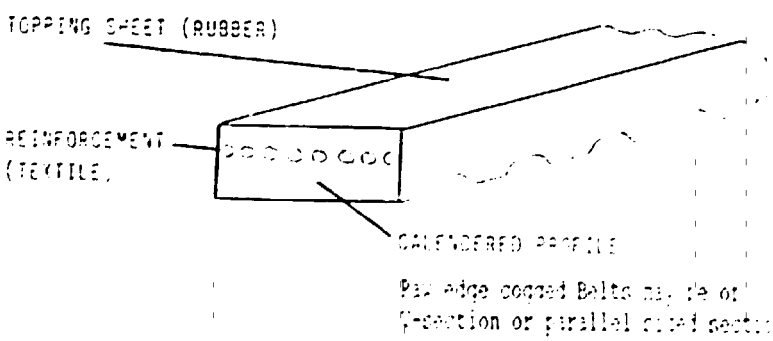
Wrapped plain V



Raw edge plain V



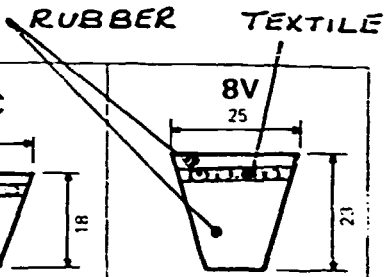
Raw edge cogged or toothed



Raw edge cogged Belts may be of transverse or parallel cord section

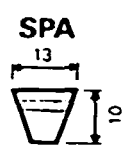
FIGURE 1

ISO4184–DIN7753–BS3790–RMA IP22



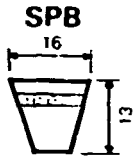
Belt Designation

Metric	Imperial
SPZ	Alpha
630	250
670	—
710	280
750	—
760	300
800	315
850	—
900	355
940	370
950	—
1000	—
1010	400
1060	—
1090	425
1120	—
1140	450
1180	—
1200	475
1250	—
1270	500
1320	—
1340	530
1400	—
1420	560
1470	580
1500	—
1520	600
1560	617
1600	630
1650	650
1700	670
1800	710
1850	730
1900	750
2000	—
2030	800
2120	—
2160	850
2240	—
2280	900
2360	—
2410	950
2500	—
2540	1000
2650	—
2690	1060
2800	—
2840	1120
3000	1180
3150	—
3170	1250
3350	—
3550	1400



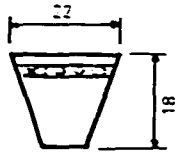
Belt Designation

Metric	Imperial
SPA	
800	—
825	—
850	—
875	—
900	—
925	—
950	—
975	—
1000	—
1030	—
1060	—
1090	—
1120	—
1150	—
1180	—
1220	—
1250	—
1280	—
1320	—
1360	—
1400	—
1450	—
1500	—
1550	—
1600	—
1650	—
1700	—
1750	—
1800	—
1850	—
1900	—
1950	—
2000	—
2060	—
2120	—
2180	—
2240	—
2300	—
2360	—
2430	—
2500	—
2580	—
2650	—
2720	—
2800	—
2900	—
3000	—
3150	—
3350	—
3550	—
3750	—
4000	—
4250	—
4500	—



Belt Designation

Metric	Imperial
SPB	Beta
1250	—
1260	500
1320	—
1340	530
1400	—
1410	560
1500	—
1600	630
1700	—
1800	710
1900	—
2000	—
2020	800
2120	—
2150	850
2240	—
2280	900
2360	—
2410	950
2500	—
2530	1000
2650	—
2680	1060
2800	—
2840	1120
3000	1180
3150	—
3170	1250
3350	1320
3550	1400
3750	—
3800	1500
4000	—
4060	1600
4250	—
4310	1700
4500	—
4560	1800
4750	—
4820	1900
5000	—
5070	2000
5300	—
5380	2120
5600	—
5680	2240
6000	2360
6300	—
6340	2500
6700	—
7100	2800
7500	—
8000	3150



Belt Designation

Metric	Imperial
SPC	
2000	—
2120	—
2240	—
2360	—
2500	—
2650	—
2800	—
3000	—
3150	—
3350	—
3550	—
3750	—
4000	—
4250	—
4500	—
4750	—
5000	—
5300	—
5600	—
6000	—
6300	—
6700	—
7100	—
7500	—
8000	—
8500	—
9000	—
9500	—
10000	—
10600	—
11200	—
11800	—
12500	—

Belt Designation

R.M.A. (Imperial)	Metric
8V	Delta
1000	2540
1120	2840
1250	3180
1400	3550
1500	3810
1600	4060
1800	4570
2000	5080
2240	5690
2500	6350
2800	7100
3150	8030
3550	9000
4000	10160
4500	11430

SPZ Lp = Lo – 13mm
SPA Lp = Lo – 17mm
SPB Lp = Lo – 17mm
SPC Lp = Lo – 26mm

Lp = Pitch length
Lo = Outside length

MASS PER UNIT LENGTH Kg/m

BELT SECTION	STD BELT	FRAS BELT	CRE BELT
SPZ	0.066	0.085	0.076
SPA	0.118	0.138	0.115
SPB	0.191	0.207	0.176
SPC	0.315	0.360	—
8V	0.542	0.576	—

Metric belt designation denotes pitch length in millimetres

Imperial belt designation denotes approximate effective length in tenths of an inch in accordance with R.M.A. Standards

Whilst the cross sections are identical some manufacturers use other designations viz

SPZ is interchangeable with A, 3V & 3L.
SPB is interchangeable with Beta, 5V & 5L.
8V is interchangeable with Delta, SPP & SPL.

SPZ, SPA, SPB & SPC belt dimensions conform to new metric belt standards published in ISO 4184

Dimensions in millimetres unless otherwise stated

Italic type indicates belt lengths available in both jacketed and C.R.E. construction dependent upon the drive design

For the automotive replacement market, wrapped plain V-belts to international standard sizes (see Figure 1) are most common, being used primarily for driving engine ancillaries:- the air cooling fan, the alternator (or generator) and sometimes the water pump.

Current vehicle designs may also have additional belt drives for air-conditioning units, camshafts, fuel injection pumps and power steering pumps and these are increasingly of the raw edge toothed type. However, these are often of non-standard sizes for specific vehicle types and necessarily of smaller production runs for the replacement market and are not considered suitable for a start up project.

The more common cross sections of V-belts are SPZ, SPA, SPB and SPC. There are standard sizes for these belts as defined in ISO 4184. The most common sizes (size denoting the pitch length in millimetres) for general and automotive use are 800mm, 900mm, 1000mm. The ISO range for non-automotive uses goes up to 12500mm.

3.0 TECHNOLOGY REVIEW

3.1 Review of Technology Options

The basic construction and production technology is common to all three types being a rubber/textile reinforcement/rubber sandwich which is compressed between rolls with adhesive.

Wrapped belts have a woven textile cloth wrapped around the complete belt which improves wear resistance and reduces the effect of liquids (such as oil or water) on the belt, whereas the toothed belt shares the same basic construction as the raw edge V-belt but has an additional operation to machine the teeth in the belt.

Materials used were traditionally rubber and cotton, but belts have since been developed using nitriles or other rubbers, and polypropylene, terylene and kevlar for the textile reinforcement. For automotive V-belts, it is now common to use nitrile rubber and polyester reinforcement textile braid.

For the GOIC market it is only sensible to consider the most popular type of automotive V-belt, namely the wrapped plain V-belt. This will be polypropylene reinforced rubber or nitrile and has the advantage of being the most common type used in general industry. Almost every car uses at least one V-belt of this type, and it is this type of belt that needs the most frequent replacement.

3.2 Review of Production Scale Ranges

The European market of over 100 million vehicles is served by only 5 or 6 major manufacturers, each typically producing 7 to 10 million belts per annum.

The GOIC vehicle population is approximately 3.3 million vehicles. The indicative market for replacement automotive V-belts of the wrapped V type can be estimated at 1.32 million belts per annum on the basis of an average of 2 belts per vehicle and an average belt life of 5 years.

The suggested production capacity of a start-up project is 30% of this market estimate, representing 396,000 belts per annum under single shift operation. This capacity would provide sufficient opportunity for expansion to service export markets and indeed the general industrial V-belt market. with the possibility of the capacity being doubled by two shift operation. These figures assume 240 working days per year, i.e. a 5 day week for 48 weeks.

These production quantities are too low to consider local manufacture of the rubber/nitrile sheet. or the weaving/braiding textile reinforcement. The scale of plant is governed by the size of the calender and 'belt-build' machines. These will have a capacity of at least 1 million units per annum. and so the plant will be somewhat oversized for the immediate market.

Once the project is established, there is the possibility of introducing cogged raw edge belts. These require a second Calender process which would really mean a second expensive machine. The raw edge does not present a special problem. as it replaces the wrapping process with one that places the 'wrapping' only along the top outer surface of the belt. In the event that the initial investment is required to include manufacture of cogged belts. then it basically means adding in a further US$172,000 of capital for a second calender machine.

The cogged unwrapped belts are usually tailored for a specific model of car. and that may mean special tooling for each model of belt. One needs to be confident of the quantities of any model of car before tooling up for special belts.

Our recommendation is to defer this additional investment

3.3 Recommended Production Technology

It is suggested that the preferred option is to start with the conventional plant wrapped V-belt because:-

- the production runs of each type will be much greater;
- the technology is more flexible:
- the non-automotive market can be served from the same production system.

V-belt plants in Europe normally serve the general market as well as the automotive market.

3.4 Sources of Technology

It is strongly recommended that operation of a start up plant is undertaken with the technical back-up of one of the established original equipment manufacturers to ensure high standards of product quality.

The following are manufacturers of belts:-

FENNER INTERNATIONAL LIMITED
Marfleet. Hull. Yorkshire. England. HU9 5RA. UK
Tel: 0482 781234 Fax: 0482 709170 Tlx: 592687

GATES HYDRAULICS LIMITED
Station Road. St Neots. Huntingdon. Cambridgeshire. England. PE 19 1QF.

Tel: 0480 75333

PIRELLI

Via e Piaaggio, 28. 66013 Chieti Scala, Italy

Tel: 0871 5091 Fax: 0871 509703 Tlx: 310135

POGGI TRANSMISSIONI MECCANICHE SPA

26, v.Di Vittorio, Villanova, 40055 Castenaso, Italy

Tel: 51 78 00 21 Fax: 71 78 17 89 Tlx: 510698

GOODYEAR INTERNATIONAL CORPORATION

1144 East Market Street, Akron, Ohio 44316, USA

Tel: 0101 216 796 2121

4.0 THE PRODUCTION PROCESS

4.1 Process Flow

The production process for conventional V belt production is summarised below (and in Figure 2). The suggested layout is shown in Appendix 1. The total production time per belt is between 4 and 5 minutes. All the operations essentially rely on manual loading of each of the machines and thereafter manual transfer to the subsequent operations in an essentially batch type operation:-

1. Preparation of Rubber

   Receive and unpack rubber sheet (quantities too small for purchasing and mixing raw rubber). The ready-to-use sheet is impregnated with adhesives required during the subsequent rolling and bonding operations.

2. Preparation of Textile Reinforcement

   For these small quantities it will be bought-in ready to use.

3. Belt Forming (see Appendix 2)

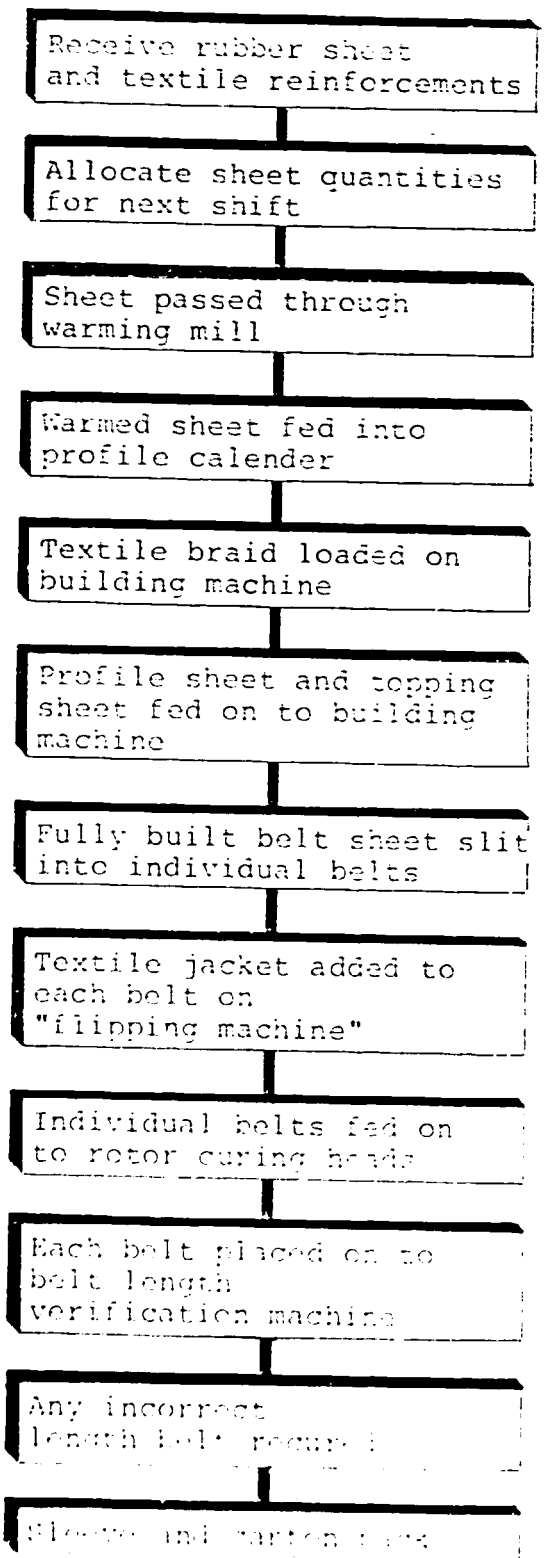
   - The rubber sheet is warmed in the warming mill (basically a set of large heater rollers): the objective is to make the rubber sufficiently pliable to accept subsequent moulding in the calendering operation.

   - The calender machine consists of two heavy duty rollers. The upper roller is plain on its surface. The lower roller has the inverse form of the V-section formed on the surface of the roller. The upper roll presses the rubber progressively into this mould as the two rolls rotate.

   - The end product of the calender process is to produce a moulded rubber sheet about one metre wide, grooved with 20 V's running parallel to its length. The length of the sheet is determined by the desired length of the finished belt

FIGURE 2

PRODUCTION PROCESS FLOW CHART FOR Automotive V-Belts



- Reinforcement textile is then fed from reel and wound on to mandrels on the building machine as a first operation, and the thin rubber topping sheet rolled on top of this textile matrix as the second operation.

- The build process combines the reinforcement matrix and the topping sheet with the wide sheet of 'calendered' rubber, having 20 or so moulded V sections, into a continuous wide loop. This loop is held into shape by the continuous filament winding of the reinforcement textile braid.

- A sheet of belts is then slit into 20 individual belts on a slitting machine.

4. Fabric Coating of Belt

- The outer woven fabric is placed on reel feeders:
- Each belt is placed on a pulley set of the fabric coating machine ('flipping machine');
- The woven fabric is fed on to outer surfaces of belt (being pre-impregnated with adhesive).

5. Belt Milling

Belt milling is an optional process, depending on belt duty. The belt is placed on rotating pulleys which feed the belt past a rubber milling head to produce a precision angle to the belt. This operation would not be required for automotive belts.

6. Belt Curing

The belts are placed on a rotor curing machine which has heated rollers and radiant heaters, the belt being rotated continuously.

7. Length Verification

The belt is run on a calibrated pulley set to check its length. Incorrect length belts may be recured.

8. Packing

A simple card sleeve around the belt is adequate for most markets and then packed in a carton.

4.2 Tooling

The large roll on the calender machine which carried the V-belt form is an expensive tool, and for that reason cross sections should be limited to types Z, A, B and perhaps C.

The large roll on the build machine does not have to be so strong and is less expensive, but must be matched to the length of final belt required. It is assumed that production will start with 800mm, 900mm, 1000mm rolls for the building machine.

4.3 Outline Machinery List

Rubber Warming Mill	US$	105.000
Profile Calender (combined roller & press)	US$	172.000
Building Machine	US$	114.000
Rubber Slitting Machine	US$	88.000
Textile Covering Insertion Machine	US$	12.000
Rotor Cure with Motorised Mandrels	US$	70.000
Length Verification Machine	US$	18.000
General, Handling & Storage Items	US$	18.000
Air Compressor	US$	18.000
Pallet Trucks, Racking, Work Surfaces, Packing Equipment & Small Tools	US$	35.000

An initial set of spare parts which may be treated as working capital inventory is costed at 7½% of the new machinery and equipment cost:

US$ 48.750

4.4 Budget Machine Cost Estimate

The estimate for the minimum machinery listed in 4.2 based on ex-works Europe costs is:-

Machines	US$ 650,000
Carriage	US$ 053,000

4.5 Budget Cost for Erection of Machinery

This assumes two specialists are sent out from Europe, and assumes an adequate supply of local labour and tradesmen. Local accommodation of specialists is not included:-

Specialist Installers	US$ 50,000
Flights	US$ 12,000

Commissioning of the machines and helping to run up the plant should form part of any know how or license agreement.

4.6 Site Requirements

A level site with mains electricity, water and sewage connections is required, with reasonable access for heavy road transport. The site should be not less than 1.5 times the floor area of the buildings, i.e., 1500 square metres (30m x 50m) for the site including 1000 square metres for the building. If finances permit, one would favour a site 2.5 times the floor area (50m x 50m) to allow for some expansion without moving site.

The site layout is shown in Appendix 1 and comprises:-

Production Area	:	580m²
Warehouse area	:	270m²

Office area	:	150m²
Hardstanding area	:	500m²

Total Land	:	1500m²

4.7 Buildings and Civil Works

The main building should be weatherproof and appropriate to local climatic conditions. There will be no abnormal floor loads.

Surface drainage should be adequate to minimise the chance of flooding the factory area.

There are no other special civil works or structural features required.

The front office section of the building should contain:-

- General Manager's office;
- Production Control office:
- Sales and Administration office.

Total office space is likely to be 15% of the total building, ie. 150 square metres and should be serviced with:-

- 3-phase electrical supply (250 kVA)
- Water (general washing and cleaning only)
- Sewage (no special effluents)

4.8 Raw Materials

The basic raw materials required are:-

a) Rubber, either NBR Acrylonitrile-butadiene copolymer
or SBR Styrene butadiene copolymer
(SBR is widely used in vehicle tyres and may therefore be the choice of a tyre

factory is in the vicinity to act as a source of raw material)

b) Textile reinforcements for the internal matrix (polypropylene yarn)

c) Textile reinforcements for the outer cover (woven polypropylene fabric)

d) Packing materials (card sleeves and cartons)

e) Lubricants

Total weight of raw materials for the specified nominal production levels is 46,000 kg per annum or 1,000 kg per working week. The rubber comprises about 44% of this weight, the textile 34% and packing 22%.

Anticipated rejection rate is 2% which can nearly always be salvaged by reprocessing.

4.9 Raw Material and Consumable Items Prices

Typical input costs per belt are:-

-	Rubber and adhesives	US$ 00.66
-	Textile Reinforcements	US$ 00.14
-	Packing	US$ 00.09
-	Consumables:-	
	Release agents. lubricants	US$ 00.02

Prices for the major raw materials are likely to be:

Material	US$/Kg
Rubber and adhesives	13.50
Textile reinforcement yarn	03.70
Packing boxes and cartons	03.60
Release agents and lubricants	12.00

The input/output ratio should be less than 1.02 once production is routine. i.e. scrap rates of under 2%. These low rates reflect the potential to recycle

rubber, and to reprocess belts that are not running 'true' when first produced.

4.10 Utility Requirements

(Typical European prices per belt)

- Electricity (ovens & machines) USS 00.035
- Water USS 00.009

Electrical requirements based on 200kW hour peak loading.
Water requirements should not exceed 4000 litres per shift.

There should be no requirement for steam or other fuels, but no allowance has been made for factory and office heating and air conditioning.

4.11 Annual Maintenance Costs

These should be low in Year 1, rising to an ongoing rate in Year 3. Typically these will be under 10% of the overhead cost, ie, under USS0.006 per belt based on Year 3 potential output. These annual maintenance costs include subcontractual local manpower costs. They are additional to the costs of maintenance carried out by personnel already employed at the factory.

4.12 Manpower Requirements

The following outline workforce can be increased as production volume builds up. but this skeleton workforce is all that the business can support in the formative years:

General Manager:

Will have production engineering, financial and man-management skills Chartered Engineer with 5 years industrial experience

Sales Manager:

Basically a working salesman. Three years' experience in selling to the motor distribution trade.

Accountant/book-keeper:

General understanding of book-keeping, debtors and creditors. To work in co-operation with Company Auditors. Five years' experience in similar work.

Office Staff (2):

Internal sales duties. GCSE or equivalent. One to have 3 years' experience of internal sales.

Production Engineer:

Qualified and experienced in continuous production work. Technician Engineer Status.

Foreman:

Must have engineering trade skills and have served formal craft apprenticeship. Experience of supervising staff.

Maintenance Fitter:

Must have engineering trade skills, and have served formal craft apprenticeship.

Operators (7):

General factory skills. but not trade skills.

Summarising the skill requirements of the above personnel:-

Management and Professional	4
Semi-skilled office staff	2
Skilled tradesmen	2
Semi-skilled tradesmen	2
Unskilled	5

4.13 Pre-Production Costs

It is assumed that this operation will be set up either as a licence operation or as a know-how deal.

A typical licence & know-how fee would be US$ 260,000 plus 5% of ex-works selling price. This fee should include the direct costs of:-

- Plant Commissioning:
- Management Staff Training.
- Operator Training;
- Initial Production Trouble-shooting.

Royalty is clearly a matter for negotiation. One would expect a 5% Royalty to cover travel and visit costs of the technology supplier for all routine matters.

4.14 Early Years Production

The following is a typical early years production profile for a new plant:-

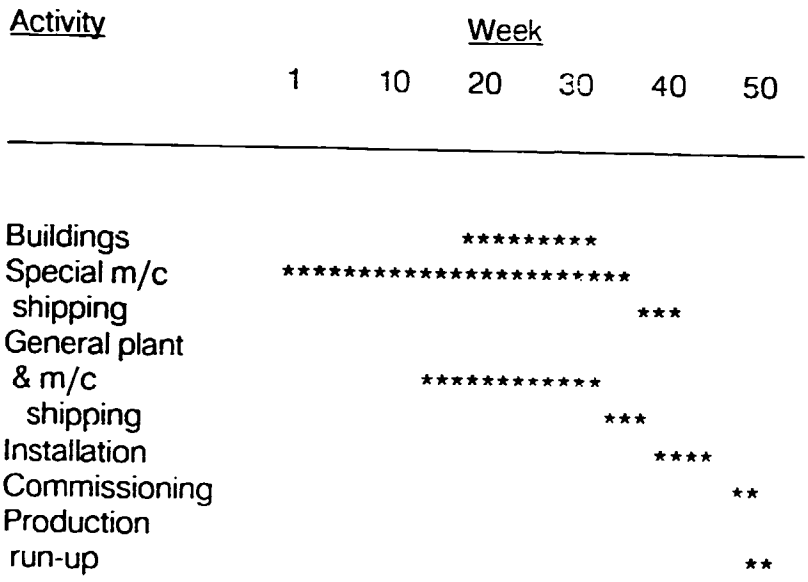
Year 1-	50,000 belts
Year 2-	150.000 belts
Year 3-	396.000 belts (full production)

4.15 Construction Period

Buildings	16 weeks
Special Machines:	26/38 weeks
Calender	
Belt Build Machine	
Slitting Machine	

Shipping	6 weeks
General Plant & Machinery	20 weeks
Shipping	6 weeks
Installation	8 weeks
Commissioning	4 weeks
Production Run-Up	4 weeks

Construction period:-



4.16 Environmental Aspects

There should be no abnormal environmental problems. Conventional waste tips should be satisfactory.

5.0 PRODUCTION COSTS

These are indicated as cost per belt based on a standard belt having an ex-works price of US $3.08

Material	US$ 0.91
Labour	US$ 0.61
Overhead	US$ 0.61
Profit	US$ 0.95

Material costs include delivery to the factory of the raw materials.

Labour costs are for direct staff, which comprises production engineer, foreman and operators plus production staff in the offices.

Overheads include indirect staff, additional staff costs. local taxes. utilities, plus selling and administrative costs.

6.0 INTERNATIONAL PRICES

Typical international retail price of a V-belt is US $5.88.

Typical pricing structure for such a V-belt is:-

Retail Price	US$ 5.88
Trade Price	US$ 4.41
Ex-Works Price	US$ 3.08

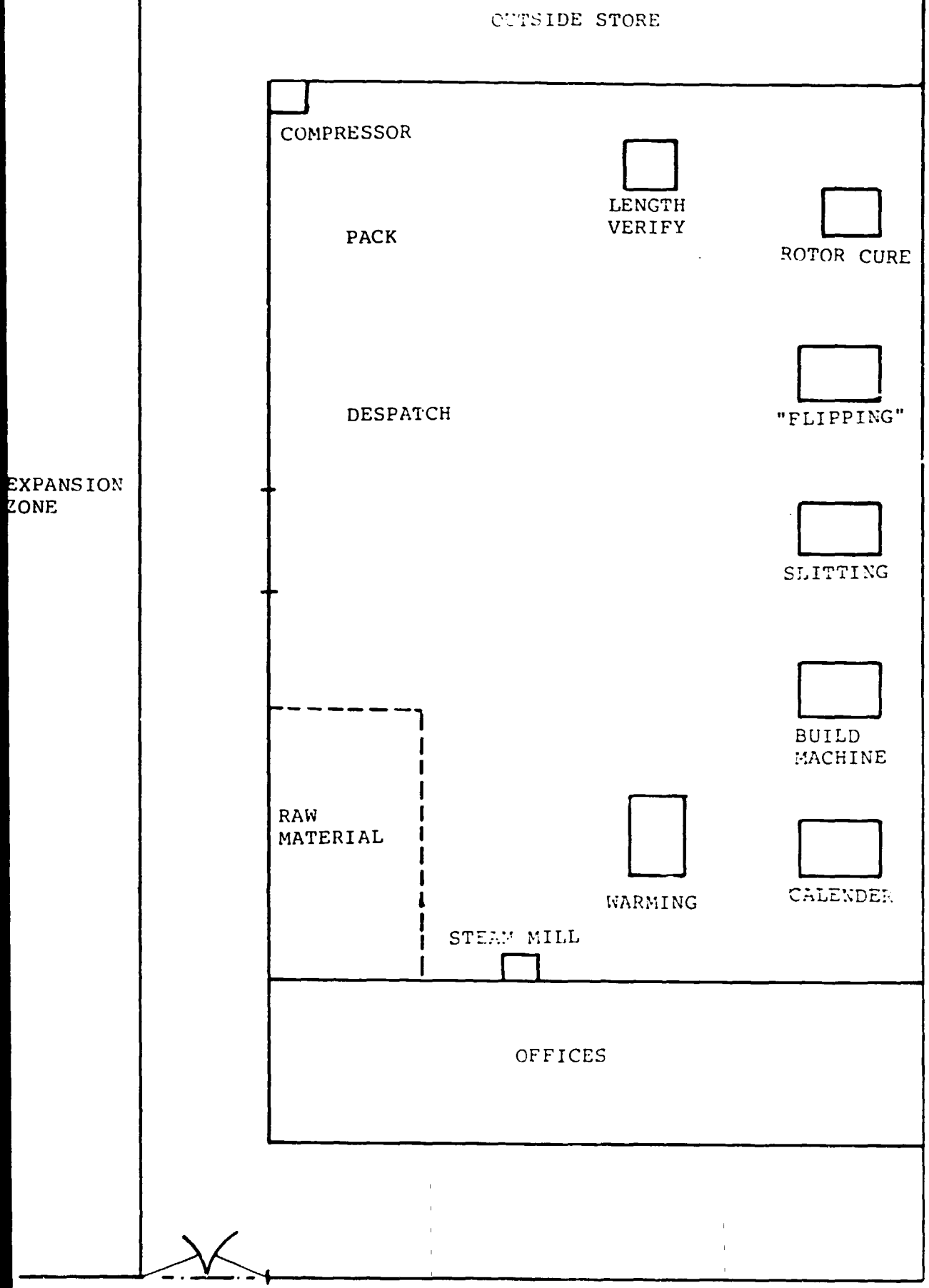
Belt prices for vehicles include typical prices as follows:-

For popular cars up to 2 litres:-

US$ 02.66	Pump belt (a flat belt)
US$ 04.38 - 7.37	Alternator drive belt (standard V-belt)
US$ 22.80	Camshaft drive belt (special toothed belt)

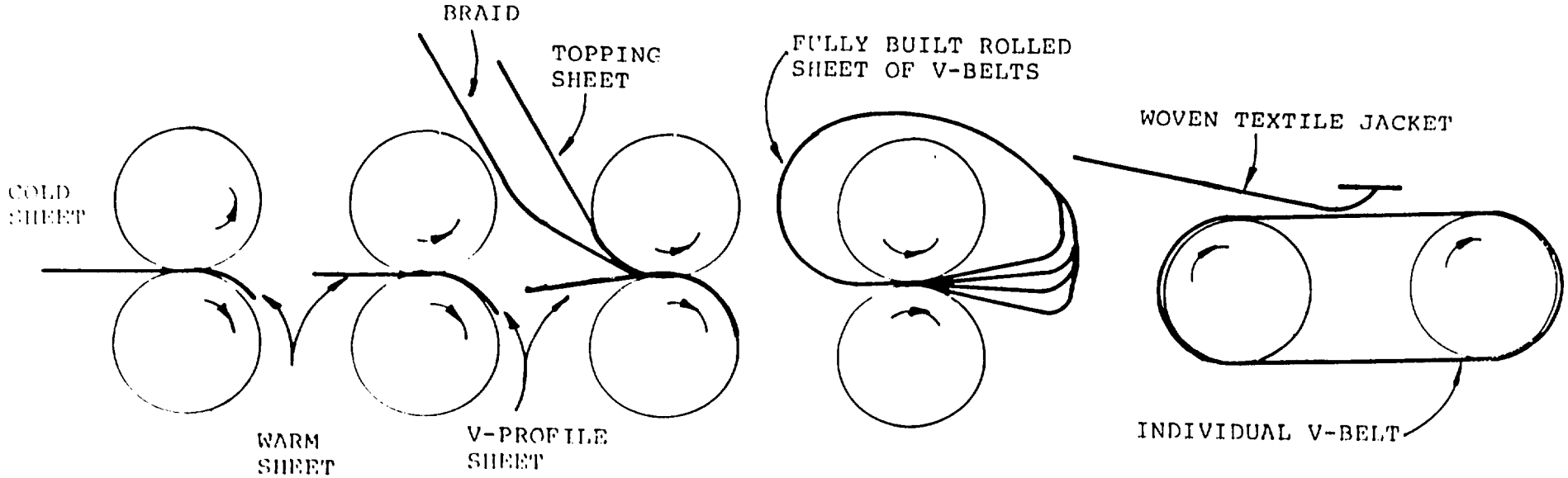
For small engines the prices are around 75% of the above, and for larger vehicles about 50% higher.

APPENDICES



V-BELT FACTORY LAYOUT

V - BELT PRODUCTION PROCESS



WARMING MILL

PROFILE CALENDER
(See Fig 1)

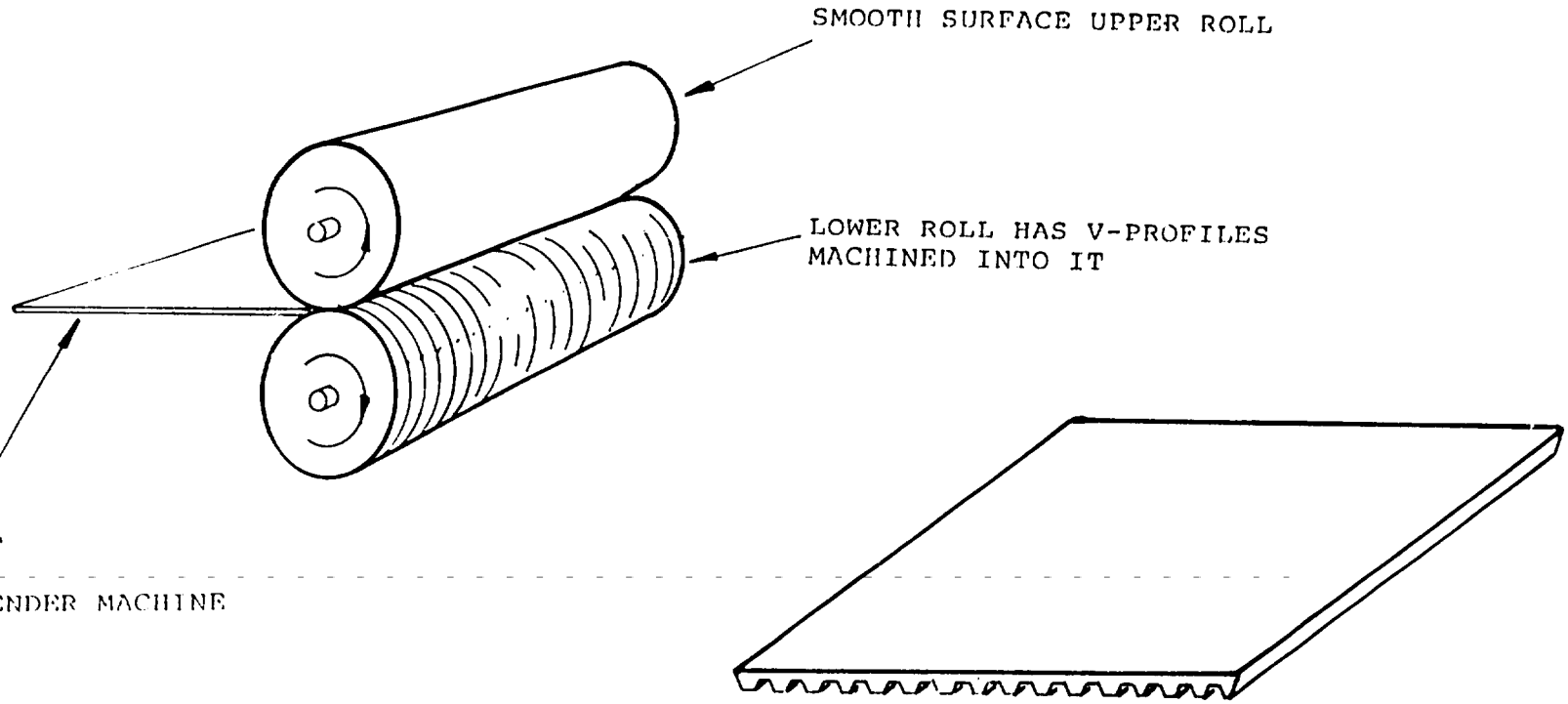
BUILD CONTINUOUS ROLL OF V-BELT SHEET
(See Fig 2 & 3)

SLIT
(See Fig 4)

"FLIP" ON TEXTILE JACKET
(See Fig 5)

APPENDIX 2

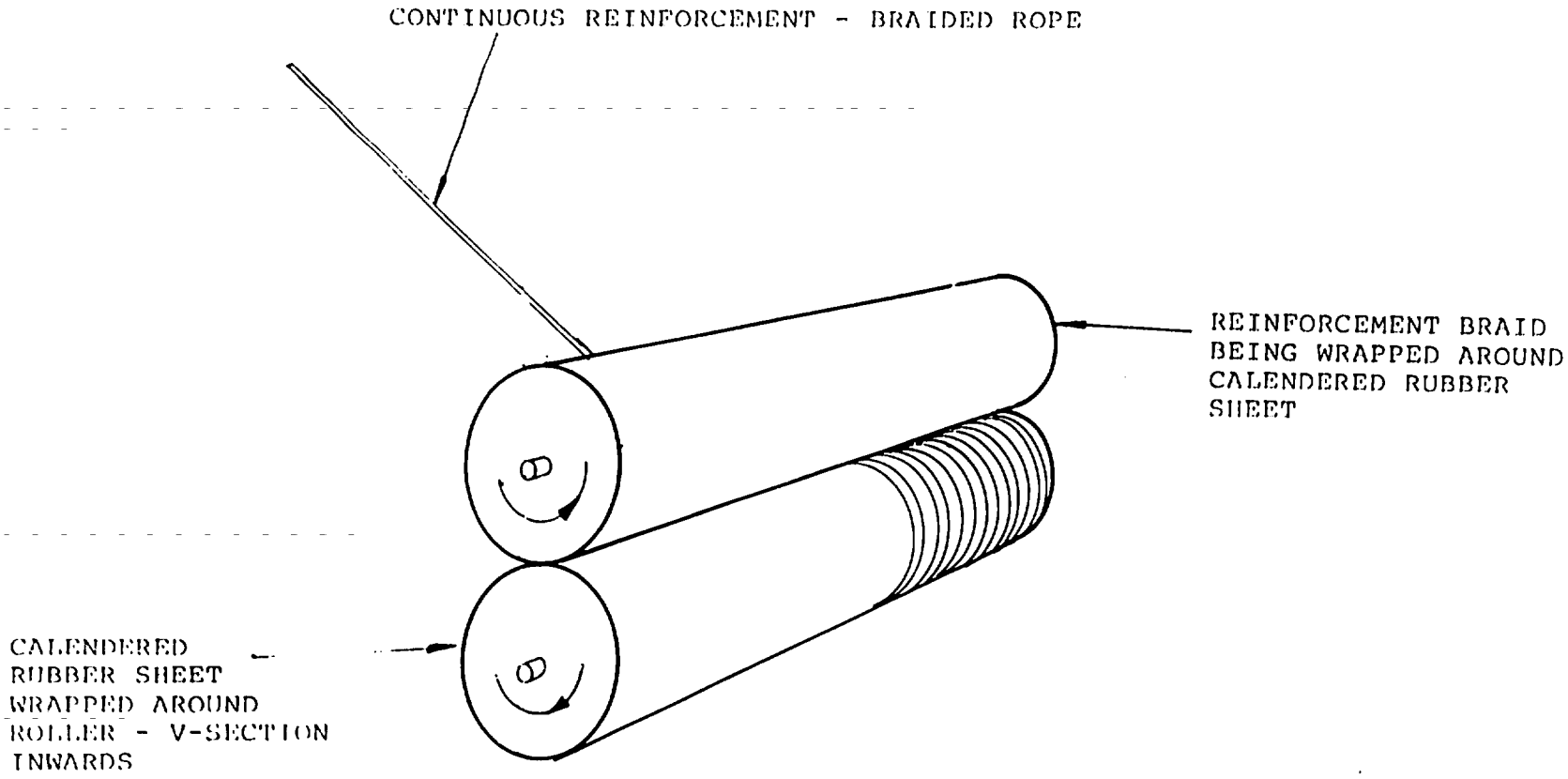
APPENDIX 2 - V-BELT PRODUCTION PROCESS



PROLIFIC CALENDER MACHINE

FIG 1

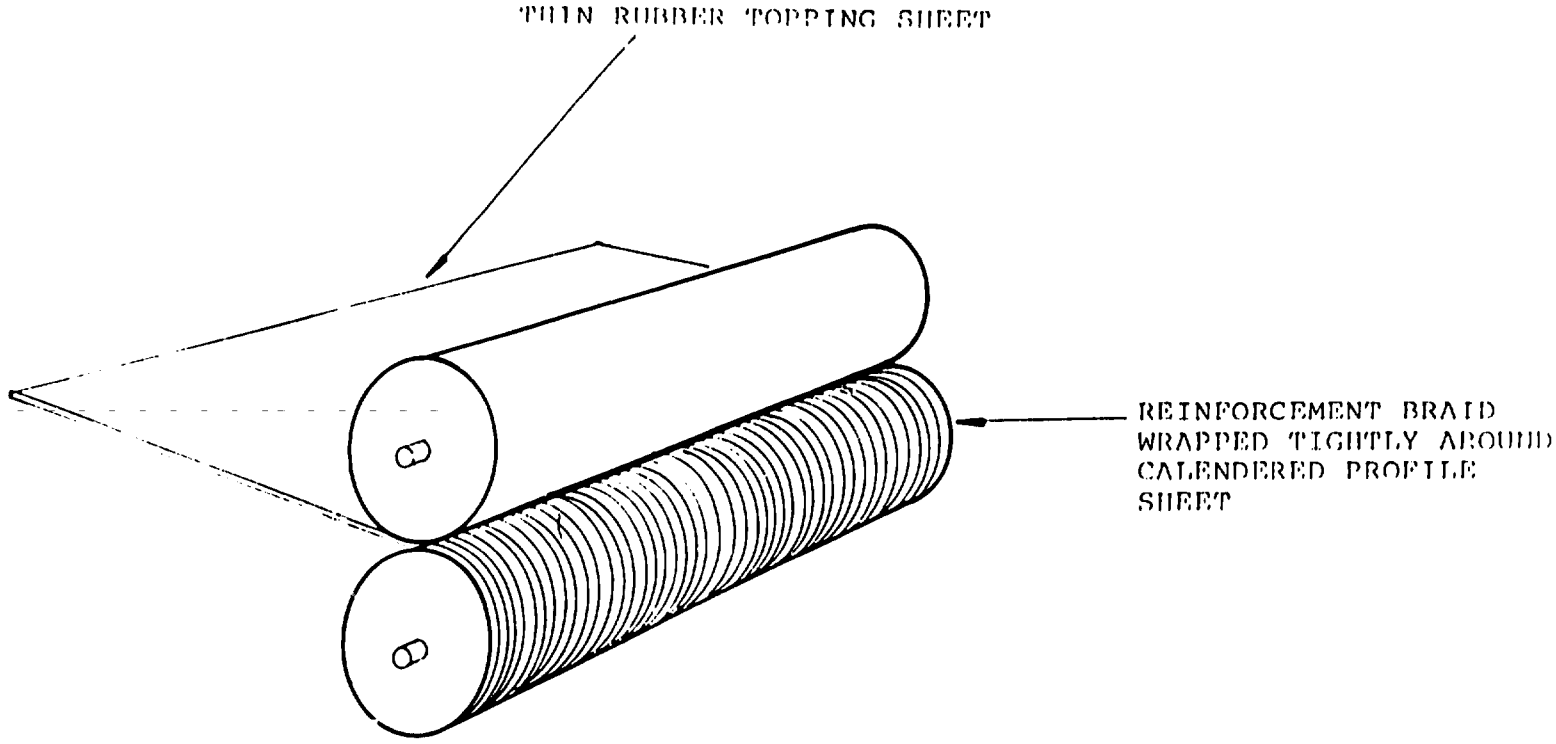
APPENDIX 2 - V-BELT PRODUCTION PROCESS



BUILD MACHINE - REINFORCEMENT BEING WOUND ON TO V-PROFILE CALENDERED SHEET

FIG 2

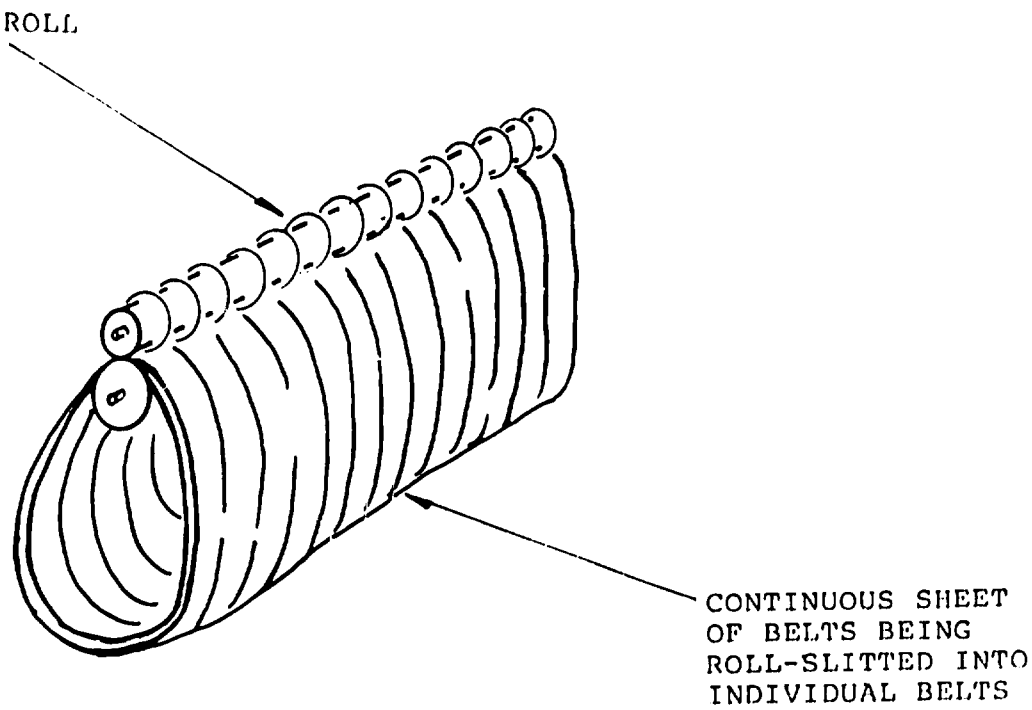
APPENDIX 2 - V-BELT PRODUCTION PROCESS



BUILD MACHINE — TOPPING SHEET BEING ROLL-PRESSED ON TO BRAIDING REINFORCEMENT TO FORM CLOSE ROLL OF BELTS.

FIG 3

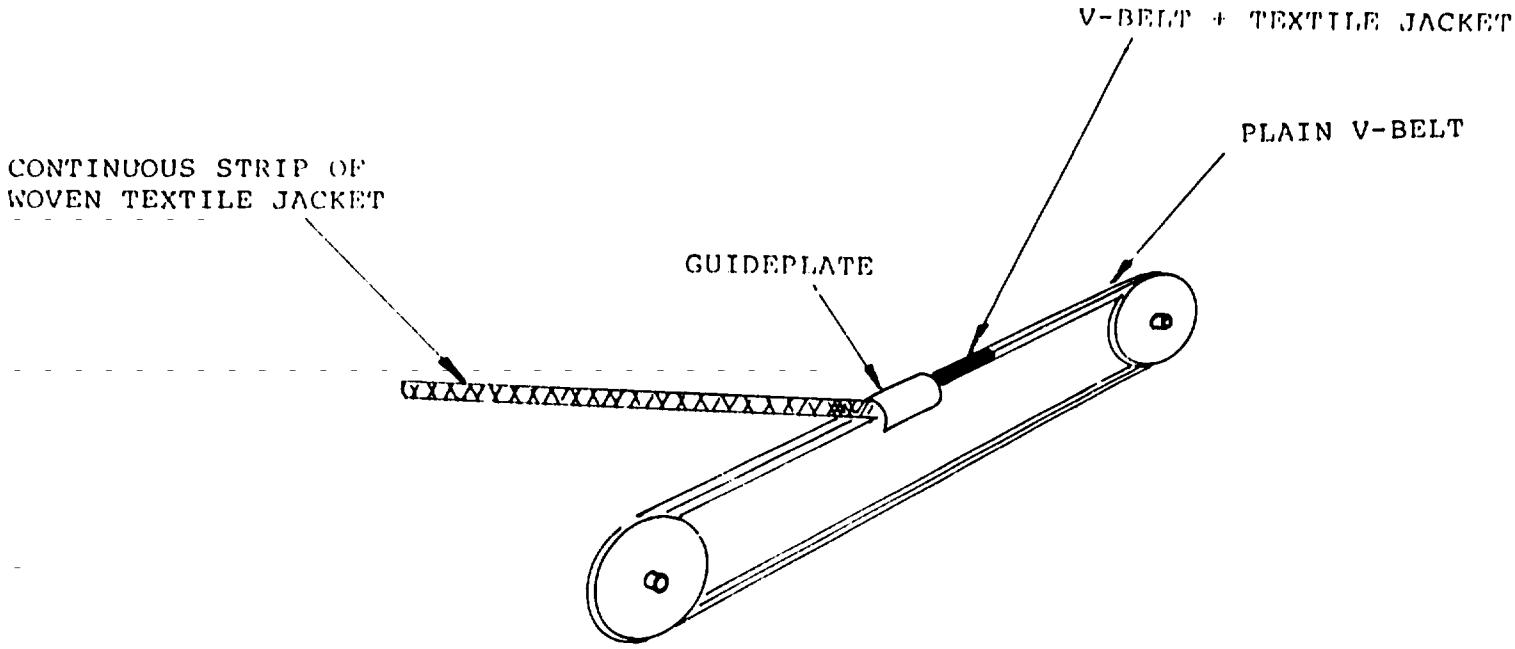
APPENDIX 2 - V-BELT PRODUCTION PROCESS



SLITTING MACHINE

FIG 4

APPENDIX 2 - V-BELT PRODUCTION PROCESS



FLIPPING MACHINE — WOVEN TEXTILE JACKET FED ON TO SLOWLY ROTATING V-BELT UNTIL BELT FULLY COVERED

FIG 5

TECHNICAL PROFILE DATA REQUIREMENTS
ASSESSMENT AND SUMMARY SHEET

Product (s)	:	V - Belts for Automotive Replacement Market
Capacity	:	396,000 belts/year
Number of Shifts	:	1.0
Number of working days/year	:	240
Production output by product (incl. efficiency ratio)	:	Year 3: 396.000 V-Belts, 2% Scrap Rate

INVESTMENT - US DOLLARS [Basic Exchange Rate Used US$1.0 = QR3.65]

- Plant/machinery (FOB):

*	Main production plant/machinery (1)	:	S 579.000
*	Storage equipment	:	S 18.000
*	Auxiliary equipment	:	S 48.000
*	Packaging equipment	:	S 5.000
*	Pollution control equipment	:	-
*	Engineering /Design fees (if required)	:	include in know-how fee
*	Sub-Total of Above Machine	:	S 650.000
*	Carriage	:	S 53.000

(1) Note. Separate detailed schedule of plant/machinery items to be attached.

- Spare parts (1 year):
  (initial set as inventory for working capital) 48.750

- Erection costs:
  (including any technical assistance)
  US$62.000 - This does not include local accommodation of specialist installers

Freight charges (to Arab Gulf Port) US$53.000

(estimate)

- Site and building requirements (M2)
  - Production area : 580m²
  - Warehouse area : 270m²
  - Office area : 150m²
  - Hardstanding area : 500m²

  Total site land : 1500m² (including 1000m² for the floor area of the buiiding

- Transport equipment : Local purchase
  (if available)

- Furniture and fixtures : Estimated by GOIC
  Local purchase
  (if available)

- Pre-production expenses (consultant component estimates)
  - Training
    - * Fees : 24.000
    - * Number of persons : 2 - 2
    - * Period : 2 weeks - 4 weeks
    - * Location : UK

    Sub Total Cost : 24.000
  - Travel expenses : 16.000
  - Commissioning : 30.000
  - Studies (if required) : 40.000
  - Licence fee (if required) : 150.000

  TOTAL : US$ 260.000 +
  5% of ex-works price

- Construction programme

  (Total in calendar months)

  - Engineering/Design/Purchase : 38 weeks
  - Delivery/equipment : 06 weeks
  - Buildings : 16 weeks
  - Installation : 08 weeks
  - Commissioning : 04 weeks

  TOTAL : 55 weeks from "go - ahead" (Please see bar-chart)

- Production programme

  (Production achievable after commissioning in %)

  - First year of production : 50.000 hoses
  - Second year of production : 150.000 hoses
  - Third year of production : 396.000 hoses

PRODUCTION AND OPERATION COSTS

Raw materials :

PRODUCT	QUANTITIES (**) T per year	PRICES (US$ T)
Rubber & adhesive	20	13.500
Textile reinforcement	15	03.700

Consumables:

(i.e. Chemicals and other materials)

PRODUCT	QUANTITIES (**) Tonnes per year	PRICES (USS/T)
Packing	10	03,600
Consumables & scrap	0.8	12.000

Royalties: 5% of ex-works price/year.

Utilities (**) USS per V- Belt (excluding building heating and air-conditioning)

Fuel	:	-
Process water	:	0.009
Electricity		0.035
Steam	:	-
Cooling water	:	-
Compressed air	:	0.010
Gas (***)	:	-
Gas oil	:	-

(**) Unit (Kg. T, m^3, ...) per unit of product or per year.

(***) Natural. LPG etc. (please define)

Maintenance cost:

(including spare parts. excluding local manpower)

$0.006/belt

Labour (by relevant skill and categories):

Production (a)	No./Shift			Administration	No.
	1	2	3		
Production Engineer	1			General Manager	1
Foreman	1			Sales Manager	1
Maintenance Fitter	1			Accountant	1
Operators	7			Office Staff	2
TOTAL	10			TOTAL	5

(a) Includes Maintenance Personnel.

International Sale Prices (By product) : USS

PRODUCT	EX - WORKS	RETAIL
V- Belt	3.08	5.89

Comparative Existing Location (b) Production Cost (breakdown)

Cost item		
Raw materials/consumables		S 0.91
Labour (direct only)		S 0.61
Utilities		overheads: indirect
Maintenance	)	S 0.61 ÷ utilities selling costs + taxes ÷ administrative cost.
General expenses	)	
Distribution expenses	)	
Depreciation	)	
Profit		S 0.95
TOTAL:		S 3.08

To be provided for comparison with Arabian Gulf cost breakdown.

(b) e.g. USA, W. Europe, Japan, Korea (as applicable).