

## NON-TECHNICAL NOTES

### DENATURANT FOR METHYLATED SPIRIT

The present annual requirement of methylated spirits may be assumed to be approximately 200,000 gallons, but it will probably increase along with the general development of the country's technology. Even this present requirement is not being met because of the lack of availability of denaturants. Generally, as prescribed by the Provincial Governments, caoutchoucine and pyridine are used as denaturants to the extent of 0.5% each. As there is no industry in Pakistan which can supply these materials, they have to be imported from abroad at a very high cost, nearly Rs. 50 per gallon for either of them. Since a total of 1% denaturant is used the cost of denaturing one gallon of spirit is 8 annas. Besides the high cost these materials are in short supply in other countries, and difficulty is therefore experienced in obtaining enough for our use. As a result of work carried out in the Central Laboratories of the Pakistan Council of Scientific and Industrial Research, a process has been developed to give high yields of caoutchoucine from waste rubber. The process essentially consists in subjecting the waste rubber to distillation in a current of super-heated steam in the presence of a catalyst, and fractionating the distillate and sulphurating it.

The capital investment in a unit of production with an annual capacity of 3000 gallons of denaturant is estimated at Rs. 42,000 with an average cost of Rs. 19/8 per gallon of denaturant as against about Rs. 50 for imported material.

#### Equipment and Raw Materials

The equipment would consist of the following: disintegrator, boiler with super heater, distillation tower, and refluxing equipment.

The raw materials required in the process are: waste rubber, chemicals, and sulphur.

#### Pre-Construction Cost Estimation

(Production capacity = 10 gal. per day on 3000 gal. per annum).

<i>Capital expenditure</i>	Rs.	Rs.
Equipment .. ..	15,000	

Building .. ..	13,000	
		28,000
<i>Running expenditure (per annum)</i>		
Raw materials .. ..	37,680	
Direct wages .. ..	5,400	
Containers .. ..	3,000	
Power .. ..	1,500	
Contingencies .. ..	2,000	
Depreciation @ 4% ..	2,800	
		52,380
<i>Indirect expenses</i>		
Promotion of the project @ 2 1/2% on Rs. 42,000 (= Capital investment)		1,050
<i>Selling expenses</i>		1,800
<i>Interest on capital @ 4% on Rs. 42,000.</i>		1,680
<i>Insurance @ 2 1/2 % on Rs. 65,000.</i>		1,642
		58,552
Cost of production of 3000 gallons of denaturants		58,552
Average cost per gallon: Rs. 19/8.		

### INSULATING TAPES

A dielectric or insulating material may be characterised roughly as having an electric conductivity of less than  $10^{-6}$  mhos/cm. Materials with conductivities in the range of  $10^{-6}$ – $10^{-3}$  mhos/cm. are semi-conductors. Usually, mechanical, chemical, thermal and cost considerations determine the choice of an insulating material. The cheapest and the simplest form of insulation is the insulating tape made of cloth or paper and coated with an insulating material. Even this type of insulating material is imported in Pakistan. It is estimated that Pakistan consumes annually about 3 lakh spools of 1/2" width and 50 yards length. A spool of these measurements imported from abroad costs about Rs. 2 to Rs. 2/8.

As a result of investigations carried out at the Central Laboratories of the Council of Scientific and Industrial Research, Karachi, it has been possible to evolve a process for the manufacture of insulating tape from exclusively indigenous raw materials. The tape is about 100% above the British Standards Specifications (B.S.S.).

The total capital investment for a unit of production for manufacturing 300,000 spools (1/2" x 50 yards) per annum is estimated at approximately Rs. 2,14,000. The average cost of a spool in a unit of this size works out to Rs. 1/7, inclusive of overhead expenses, as against the present market price of Rs. 2 to Rs. 2/8.

### Process, Equipment and Raw Materials

The process involves the following unit operations: mixing the various ingredients, coating of the tape, drying of the tape at controlled temperature and winding of the tape and cutting into spools of required sizes.

The equipment required for the process consists of: jacketted vessel with mixing and temperature control device, bath for coating purpose, drying chambers and winding and cutting machine.

The raw materials required are: insulating medium, vehicle, filler and cloth.

All these materials are available in the country.

### Pre-Construction Cost Estimation

(Production capacity = 3 lakh spools per annum)

#### Capital expenditure

	Rs.	Rs.
Equipment .. ..	70,000	
Building .. ..	43,000	
		1,13,000

#### Running expenditure (for 3 months)

Raw materials ..	85,275	
Direct labour ..	3,330	
Indirect labour ..	3,210	
Selling expenses ..	1,260	
Packages, power, interest on capital and contingencies	7,865	
		1,00,940

Total capital investment	2,13,940
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Cost of production of 3 lakh spools	4,28,763
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Average cost Rs. 1/7 per spool.

### HEAT AND SOUND INSULATION BOARDS FROM SUGAR-CANE BAGASSE AND OTHER AGRICULTURAL WASTES

Sugar-cane bagasse, reeds, coconut fibre, rice husks and similar other materials find little economic use and are wasted in considerable quantities. For instance, bagasse which is a by-product in the process of cane crushing is mainly used as a cheap fuel for boilers in sugar-cane factories, but even after meeting the requirements of fuel, large quantities are left over as surplus for which there is practically no use.

With a view to utilise these materials, investigations were undertaken in the Laboratories of the Council of Scientific and Industrial Research, and it has been possible to evolve a commercially feasible process for the manufacture of low-cost heat and sound insulation boards which can be used in buildings for partitions, false ceilings, etc. These boards have a thermal conductivity of 0.09 (same as glass wool), 1 inch thickness of the board being roughly equivalent to 10 inches of brickwork in respect of insulation, and a tensile strength of 90 lbs. per sq. inch. These boards can also be used for light weight roofs in a sandwich system of water proof material. On account of the light weight of the roof, made of sandwiched boards, the supporting structure and the load-bearing walls need not be as strong as would be necessary for any other normal type of roof, thus resulting in a considerable amount of saving in the overall construction cost.

The total capital investment for a unit producing annually 60,000 boards of 8" x 4" x 1" thick is estimated at approximately Rs. 5,25,000. The average cost per sq. ft. of the board in a unit of this size is estimated at 2½ annas. The market price of similar board is 8 to 10 annas per sq. ft.

### Process, Equipment and Materials

The process of manufacturing these boards consists of the following unit operations: shredding, cooking, mixing and beating, pressing in moulds, and drying.

The process is simple, requiring very little specialised knowledge or technical know-how,