POLYETHYLENE WAX

CONTENTS

SECTION I PRODUCT CHARACTERISTICS AND SPECIFICATION

SECTION II PRODUCT APPLICATIONS

SECTION III INDIAN MANUFACTURERS

SECTION IV IMPORT/EXPORT LEVEL

SECTION V PRICE DETAILS

SECTION VI INDIAN DEMAND

SECTION VII BROAD OUTLINE OF MANUFACTURING PROCESS

SECTION VIII RAW MATERIAL REQUIREMENTS, UTILITY AND AVAILABILITY

SECTION IX GLOBAL SCENARIO

SECTION X DISCUSSIONS ON ECONOMIC CAPACITY, PROJECT COST AND PROFITABILITY PROJECTIONS

SECTION XI SWOT ANALYSIS

SECTION XII FACTORS INFLUENCING THE POSITION FOR A NEW INDUSTRY AND RECOMMENDATIONS
SECTION I

PRODUCT CHARACTERISTICS AND SPECIFICATION

1.1 General details

Classification: To classify waxes in a purely chemical sense has not become easier with the advances made in the wax industry.

The study of the structure of waxes has contributed much to the understanding of their chemical and physical nature, but on the other hand, a classification on a purely chemical basis has become more and more difficult.

Thus, the classification given here has to serve the practical purposes of the classification of the wax industry.

Popular natural and synthetic waxes:-

<table>
<thead>
<tr>
<th>Natural waxes</th>
<th>Synthetic waxes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bees wax</td>
<td>Polyethylene wax</td>
</tr>
<tr>
<td>Carnauba wax</td>
<td>Polypropylene wax</td>
</tr>
<tr>
<td>Ozokerite wax</td>
<td>PTFE wax</td>
</tr>
<tr>
<td>Spermaceti wax</td>
<td>Amide wax</td>
</tr>
<tr>
<td>Shellac wax</td>
<td>Petroleum wax</td>
</tr>
<tr>
<td>Japan wax</td>
<td>Montan wax</td>
</tr>
<tr>
<td></td>
<td>Polymeric wax</td>
</tr>
</tbody>
</table>

A. True natural waxes:

Vegetable
Animal
Mineral (bituminous or fossil)

B. Synthetic waxes:

Synthetic waxes of true wax structure
Synthetic waxes of different structure

C. Waxy substances:

Saponifiable substances such as fatty acids, hydrogenated oils
Fatty or wax alcohols
Hydrocarbon waxes
1.2 Classification of Hydrocarbon waxes

1.2.1. Normal alkanes:-

Petroleum and tar paraffin waxes (mineral origin)
Carbon monoxide hydrogenation waxes, F.T. waxes
Ketone hydrogenation waxes, IG wax Z
Polyethylenes, e.g. alkathenes

1.2.2. Iso-alkanes:-

Mined ozokerites
Petroleum microcrystalline waxes
Other waxes, IG wax OZK

1.2.3. Oxygenated hydrocarbons:-

Partly oxidised paraffin waxes (modified) e.g. IG wax PS partly oxidised microcrystalline waxes, crown wax

1.2.4. Aromatic hydrocarbons:-

Terphenyls (syn), e.g. Santo wax O

1.2.5. Chlorinated hydrocarbons:-

Chlorinated alkanes (syn) e.g. Chlorpropane wax
Chloro napthalene (syn), e.g. Seekay W
1.3 Properties of Polyethylene wax

| Appearance | Hard, white, translucent, tasteless, non toxic, odourless. |
| Form | Polyethylene wax is available as pellets, powders or flakes. |
| Melting point | 97-115 deg.C |
| Specific gravity | 0.922 |
| Other details | Excellent stability against polishing, scratch resistance, metal mark resistance, scuff resistance |
| | Polyethylene wax is resistant to water and chemical materials. |

1.4 Typical properties of Polyethylene wax made by various global producers

<table>
<thead>
<tr>
<th>Wax</th>
<th>Melting point, deg.C</th>
<th>Ring-and ball deg.C</th>
<th>Penetration, 0.1mm, 25 deg.C</th>
<th>Penetration, 0.1mm 60 deg.C</th>
<th>Viscosity at 149 deg.C</th>
<th>Density at 23 deg.C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allied A-C6 polyethylene</td>
<td>106</td>
<td>106</td>
<td>4</td>
<td>20</td>
<td>220</td>
<td>0.92</td>
</tr>
<tr>
<td>BASF A polyethylene</td>
<td>108</td>
<td>108</td>
<td>3</td>
<td>15</td>
<td>450</td>
<td>0.92</td>
</tr>
<tr>
<td>Ciech WP-2 polyethylene</td>
<td>110</td>
<td>101</td>
<td>3</td>
<td>15</td>
<td>200</td>
<td>0.93</td>
</tr>
<tr>
<td>Epolene N-12polyethylene</td>
<td>110</td>
<td>113</td>
<td>1</td>
<td>9</td>
<td>220</td>
<td>0.94</td>
</tr>
<tr>
<td>Hoechst PA130 polyethylene</td>
<td>125</td>
<td>126</td>
<td>1</td>
<td>4</td>
<td>320</td>
<td>0.93</td>
</tr>
<tr>
<td>Leuna LE 114 polyethylene</td>
<td>115</td>
<td>116</td>
<td>2</td>
<td>7</td>
<td>260</td>
<td>0.93</td>
</tr>
<tr>
<td>Polywax 500 polyethylene</td>
<td>86</td>
<td>86</td>
<td>7</td>
<td>61</td>
<td>3</td>
<td>0.94</td>
</tr>
<tr>
<td>Polywax 2000 polyethylene</td>
<td>125</td>
<td>125</td>
<td>1</td>
<td>2</td>
<td>50</td>
<td>0.96</td>
</tr>
<tr>
<td>Veba A227 polyethylene</td>
<td>108</td>
<td>108</td>
<td>2</td>
<td>10</td>
<td>260</td>
<td>0.93</td>
</tr>
</tbody>
</table>

1.5 Grades of Polyethylene wax

Polyethylene waxes can be made in two main grades, emulsifiable and non emulsifiable waxes.

The difference between both the grades are in relation to the molecular weight. The products are made in the molecular weight range of around 6000 and in the range of around 2000 to 4000.
High molecular weight Polyethylene wax:-

Molecular weight : 4000 and above  
Properties: Melting point - more than 48 deg.C (the difference with `oil`)  
Usage sector: Plastic resin

Low molecular weight Polyethylene wax:-

Molecular weight: Upto 4000  
Properties : No chemical change at higher temperatures  
Usage sector Wax, oil
SECTION II

PRODUCT APPLICATIONS

2.1 General details

Polyethylene wax /Polypropylene wax act as activator and dispersing material for Polyethylene, Polypropylene, ABS resins.

Waxes are mainly dispersions of polyethylene’s hydrocarbons, or vegetable and animal waxes in the vehicle system used. They impart slip and scuff resistance to ink films. Lately, polyolefinic waxes are also used directly in micro-pulverised form.

The addition of Polyethylene wax to hydrocarbon waxes increases the melting points of such waxes to a marked degree. These waxes are compatible with petroleum and other waxes.

2.2 Polyethylene wax emulsion

Polyethylene wax can be made in two main grades, emulsifiable and non emulsifiable ones.

Emulsifiable polyethylene wax:

Emulsifiable polyethylene wax is an important textile processing chemical

Emulsifiable polyethylene wax is used in textile finishing, leather auxillaries, cosmetics, crayons, polishes, paper coating, adhesives and packing industry. It is an important textile processing chemical.

Non emulsifiable polyethylene wax:

Non emulsifiable polyethylene wax is used as carriers for pigment concentrates, lubricants for plastics and elastomers, paints and printing ink industry.
2.3 Use in textile sector

Polyethylene wax emulsions are stable softeners. Polyethylene is present in the emulsion in the form of dispersion of fine particles in water.

Usually a non ionic emulsifier is used to emulsify polyethylene because it is compatible with most finishing ingredients. These emulsions tolerate the presence of acids, polyvalent metal salts, amine hydrochlorides, resin precondensates etc.

They do not yellow white fabrics, do not change the colour of dyeing and prints and do not retain chlorine.

The emulsions can be made into any desirable particle size by varying the quantity and the type of the emulsifier.

Polyethylene wax emulsion is available as milky white emulsion, which can be readily diluted with hot, cold or even hard water, which does not affect it since it is non ionic in character. It is compatible with anionic, cationic and non ionic auxiliaries.

It is also stable towards metal salts and acidic catalysts normally used in resin finishing. These emulsions give adequate fastness to washing. Use of polyethylene emulsion as to softening agent minimises the defects of resin finishing of cellulosic fabrics and blends and the emulsion minimises the reduction in strength and abrasion resistance.

Polyethylene emulsion acts as lubricating agent, imparting softness and suppleness to the treated fabric, which is fast to repeated launderings. In the resin finishing bath, 15 to 20 kg/litre of the polyethylene wax emulsion may be used.

Polyethylene wax emulsion may be used as a pure finish, for which the fabric may be padded through a diluted emulsion at a suitable concentration and the required percent expression so as to deposit 1 to 5% of polyethylene on the fabric. The pad liquor is easily prepared by diluting the polyethylene emulsion to the required volume. The fabric is then dried.

Polyethylene wax emulsions may be applied on natural and synthetic fibre fabrics. The treated fabrics possess improved stitch resistance, thereby facilitating the sewing operation, even when carried out under which speed conditions.

Polyethylene treatment improves the feel of the fabric when used alone or in combination with other finishing ingredients like quaternary ammonium compounds, silicone emulsion etc.
The softener slides the yarns away from the needle during sewing and lubricates the passage of the needle through the fabric. It locks the fibres in position, thus giving less pilling trouble. This is important in the processing of spun acrylic acid polyester fibre materials. It imparts good release properties to the fabric on ironing. The effect of polyethylene on the shade and colour-fastness properties of the dyed durable press fabric is very little.

2.4 Use in food packaging sector

Low molecular weight polyethylenes having wax like properties are used in conjunction with petroleum waxes in food packaging applications.

The FDA allows the use of polyethylene in indirect food additive applications under the olefins regulation. This regulation couples a lower molecular weight limit with certain solubility tests. Some low molecular weight polyethylenes, although meeting the molecular weight test, fail the solubility tests but are not of the structure nor meet the molecular weight requirements of the FDA synthetic wax regulations i.e. the polyethylenes must have molecular weights of 500 to 1200. Therefore, at least in the United States, caution is recommended when considering the use of polyethylene with molecular weights of 1200 to 2000 in food related applications.

2.5 Use in coating sector

Waxes have a long history of use in printing inks, paints and coatings. They impart mark and scratch resistance, improved slip, rub resistance and water repellancy. The main characteristics to consider when selecting a wax are its particle size, hardness and melting point. Waxes are commonly added to a maximum level of 0.25% to 2.0% of the ink or coating formulation.

Mar resistance: As little as 0.25 to 1.0% of wax on solids content is beneficial in Nitro Cellulose lacquers, baking enamels, organosol coatings, acid curing and force drying finishes. The secret to the improvement is the reduction in the coefficient of friction. Thus objects striking the surface have a greater tendency to slide or slip over the surface than to damage it.

Anti blocking: The presence of wax will prevent blocking in wood and metal finishes which are stacked shortly after drying. Typical examples would be acid curing and force dyeing finishes for wood baking enamels, varnishes for metal sheets or coils.

Slip of formability: A key property of polyethylenes is their use in other industries as external lubricants and processing aids. The principles are applicable to the coatings industry and their properties make them useful in metal finishes, which must undergo forming or embossing after application.
Anti settling and anti sagging: Polyethylenes display thixotropic behaviour when dispersed in aromatic and aliphatic solvents. This is a valuable property when they are added to pigmented finishes, when good anti settling characteristics are important. The thixotropy is also useful for anti sagging character.

Thixotropic behaviour is also exhibited by the EVA copolymers and this coupled with the extremely fine particle size of EVA dispersions enables them to be used to good effect in automotive finishes.

Flatting: Polyethylene dispersions are effective flatting agents in a wide variety of finishes. The degree of flatting is very much dependent upon the particle size of the dispersion; this is governed by choice of the polyethylene and the solvent or solvent mixture.

As flatting agents, they are particularly interesting as they have a fine balance of other useful properties; excellent transparency, smoothness, soft silky feel, inertness to chemicals and non settling behaviour.

Abrasion resistance: Waxes including Polyethylenes improve abrasion resistance to a significant degree.

Metal marking resistance: A dark mark can occur on coil coated and thermosetting acrylic enamels if struck by a metal object. This tendency is reduced or the mark is more easily removed, if the finish contains wax.

2.6 Use in inks sector

Rub resistance/scratch resistance: Waxes, including polyethylenes are employed as additives to almost every ink type which encompasses letterpress, lithographic, gravure and flexographic. Thus, the waxes are used from dispersions in a wide variety of solvents ranging from oils, aliphatics and aromatics to glycols and water.

The main functions are to improve scuff and scratch resistance, to reduce blocking or offsetting of stacked sheets and generally modify the coefficient of friction or slip.
SECTION III

INDIAN MANUFACTURERS

3.1. Polyethylene wax

National Organic Chemicals Ltd., (NOCIL), has facilities for the production of Polyethylene Wax. It is reported that the plant is not in operation in recent times.

3.2. Indian Manufacturer of Polypropylene Wax

Indian Petrochemical Corporation Ltd. (IPCL) has been the sole producer of Polypropylene Wax in the country.

It is reported that IPCL has suspended the production of Polypropylene Wax recently.

3.3 Indian manufacturers of Polyethylene Wax emulsions

There are a few producers in the country who imports and formulates Polyethylene Wax to produce Polyethylene Wax Emulsion.

Indian producers of Polyethylene Wax emulsion include the following:

* Sree Lakshmi Industries,  
  Plot No.74/A, II Floor,  
  Kalyan Nagar, Hyderabad-500 038.

* Quinn India Ltd.,  
  8-2-268/N/28/A Road No.2  
  "Quinn House" Banjara Hills, Hyderabad 500 034.

* Industrial and Tanning Chemicals,  
  Bangalore Road, Abdullahpuram, Vellore.

* Aksol Chemicals,  
  71, Sidco Indl. Estate, Ranipet 632 403  
  Phone (0417)2084025

* Jaju Chemical Industries  
  T.P. No.4, Plot No.64  
  Bombay-Hyderabad Highway  
  Solapur
* Rachana Chemicals
  W-160 (B), MIDC,
  Taloja, Dist.. Raigad
  Maharashtra

* Kwality Agro-Vet Inds.P.Ltd.,
  Plot No.D-148, TTC Indl. Estate
  MIDC, Thane-Belapur Road
  Shirwana Village
  New Bombay

* Orinco Chemical Industries
  C-215, MIDC, TTC Indl. Area,
  Turbhe,
  New Bombay

**Indian production level**

Nil
SECTION IV

IMPORT/EXPORT LEVEL

3.1. Present import level

Around 1500 tonnes per annum

Countrywise Imports

Period April 2001 to March 2002

<table>
<thead>
<tr>
<th>Country</th>
<th>Quantity in Kgs</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>150</td>
</tr>
<tr>
<td>German F REP</td>
<td>392056</td>
</tr>
<tr>
<td>Italy</td>
<td>5660</td>
</tr>
<tr>
<td>Japan</td>
<td>151755</td>
</tr>
<tr>
<td>Korea RP</td>
<td>156000</td>
</tr>
<tr>
<td>Malaysia</td>
<td>165120</td>
</tr>
<tr>
<td>Qatar</td>
<td>132000</td>
</tr>
<tr>
<td>Singapore</td>
<td>12600</td>
</tr>
<tr>
<td>Switzerland</td>
<td>20547</td>
</tr>
<tr>
<td>Thailand</td>
<td>264700</td>
</tr>
<tr>
<td>UK</td>
<td>992</td>
</tr>
<tr>
<td>USA</td>
<td>116252</td>
</tr>
</tbody>
</table>

Sample of individual imports of Polyethylene Wax

Period 2002

<table>
<thead>
<tr>
<th>Name of the Importers</th>
<th>Quantity in tonnes</th>
<th>Value in Rs.</th>
<th>Country</th>
<th>Date</th>
<th>Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polygel Technos. (India)</td>
<td>30.000</td>
<td>574306</td>
<td>Malaysia</td>
<td>11.02.2002 to 19.02.2002</td>
<td>Mumbai</td>
</tr>
<tr>
<td>Hindustan Inks &amp; Ltd.</td>
<td>1.000</td>
<td>113479</td>
<td>U.S.</td>
<td>24.03.2002 to 31.03.2002</td>
<td>Mumbai</td>
</tr>
<tr>
<td>Coates of India Ltd.</td>
<td>1.300</td>
<td>712708</td>
<td>U.S.</td>
<td>01.04.2002 to 05.04.2002</td>
<td>Mumbai</td>
</tr>
<tr>
<td>Hindustan Inks &amp; Resins</td>
<td>1.400</td>
<td>159683</td>
<td>U.S.</td>
<td>01.05.2002 to 07.05.2002</td>
<td>Mumbai</td>
</tr>
<tr>
<td>Polygel Technologies (India)</td>
<td>30.000</td>
<td>505828</td>
<td>Malaysia</td>
<td>11.06.2002 to 17.06.2002</td>
<td>Mumbai</td>
</tr>
<tr>
<td>Camlin Ltd.</td>
<td>0.100</td>
<td>7400</td>
<td>Thailand</td>
<td>01.08.2002 to 07.08.2002</td>
<td>Mumbai</td>
</tr>
</tbody>
</table>

3.2. Present export level

Nil
### SECTION V

#### PRICE TRENDS

<table>
<thead>
<tr>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic price</td>
<td>Rs.130 per kg</td>
</tr>
<tr>
<td>Taxes and duties</td>
<td>Extra as applicable</td>
</tr>
</tbody>
</table>
SECTION VI
INDIAN DEMAND

6.1. General Details

Industry considers a wax to be fatty solid with varying degrees of lubricity and plasticity.

The technology in the coatings and ink field has grown over the years and the wax industry has changed with it. Natural waxes were first used in coating and ink industries. Natural waxes may of vegetables, animal origin. The most prevalent of these waxes is Carbauba, which is still widespread in use. Carbauba wax is obtained from the leaves of a species of palm.

When less expensive petroleum waxes became suitable, formulators discovered new characteristics which made these waxes unique among raw materials. Paraffin is obtained from the wax tailings remaining in the stills after the distillations of pure petroleum. Paraffins quickly became the additive of choice and entered into the greatest variety of formulations than any other waxes. Micro crystalline waxes also belong to this class. These are obtained by dewaxing heavy lubricating oils and petroleum residues.

Over the years, many of the so-called synthetic waxes entered the market. Most prevalent of these materials are Fisher-Tropach waxes.

More recently, the waxes of choice are Polyethylene waxes, with molecular weights of 1000 to 3000, odourless, tasteless and nontoxic. Today, Polypropylene waxes with melt points around 150°C are being used in high bake and low gloss applications. The use of synthetic waxes have become much more widespread over the past two decades with the advances made with micronising techniques.

One of the main Wax types used today are the low molecular weight polyethylenes both homopolymers and their partially oxidised derivatives. Low molecular weight would be defined by a number average ranging from 2000 to 5000 approximately.

This level is, of course, considerably higher than paraffins, microcrystallines and F-T Wax. This difference renders them tougher and this in conjunction with their varying hardness and slip characteristics makes them ideal additives in inks and coatings. Use level could be roughly described as concentrations ranging from 0.25 to 5% on solids.
6.2. Consuming sectors

The present consumption of Polyethylene Wax in India is largely confined to the following sector.

1. Printing ink industry
2. Coating industry
3. Toner industry
4. Textile auxiliaries
5. Adhesive industry

6.3. Important formulations involving Polyethylene Wax used in India

A few of the important formulations where Polyethylene Wax is used in various sectors include the following:

1. Rotary heat set publication ink

   Phthalocyanine blue       14 parts
   Alumina hydrate          10 parts
   Pentaerythritol rosin ester/
   HC solvent               35 parts
   HC resin in HC solvent   30 parts
   Polyethylene Wax compound 6 parts
   Aliphatic HC solvent (20 C) 5 parts.

2. Hotmelt adhesives:

   a) Alkyds (modified polyesters)
   b) Asphalt and coaltar bitumin
   c) Coumarone-Indene resins
   d) Phenolic resins (heat stable)
   e) Rosin and derivatives
   f) Terpene resins
   g) Polyethylene Wax/microcrystalline Wax

3. Aerosol furniture polishes:-

   Polyethylene Wax       3%
   Silicone oil DC 200    1.8%
   V.M. & P. Naphtha      32.2%
   Perfume                Small quantity
   Freon 12/Freon 11 (1:1)-65.0

   Dissolve the Wax, silicone oil and perfume in naphtha to get the polish.
4. Polish for asphalt, vinyl and rubber tiles:-

Polyethylene Wax dispersion (16%) 37.5 parts
Bleached, bone dry, leWax shellac (12%) 12.5 parts
Polymethyl methacrylate dispersion 38% 12.5 parts
Polystyrene dispersion 405 37.5 parts

Polyethylene dispersion is prepared by melting the Wax and acid, cooling to 110 to 115 C and adding the morpholine. The mixture is stirred for 1-2 min. and then rapidly poured into hot water with agitation.

Polyethylene Wax 49.5 parts
Oleic acid 9.4 parts
Morpholine 6.4 parts
Water 309.6 parts

5. Antiblock Wax paper coating:-

Microcrystalline Wax 70 parts
Paraffin Wax 20-25 parts
Polyethylene Wax 5-10 parts

6. Quick breaking emulsions:- (gives better gloss and low smear)

<table>
<thead>
<tr>
<th>Types</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carnauba (yellow)</td>
<td>2.0</td>
<td>-</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Ceresin</td>
<td>-</td>
<td>-</td>
<td>2.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>BeesWax</td>
<td>-</td>
<td>2.0</td>
<td>-</td>
<td>2.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Paraffin Wax (52-54)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1.0</td>
</tr>
<tr>
<td>Silicone oil (200-500)</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Sorbitan monostearate</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Polyethylene Wax</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Distillate</td>
<td>10.0</td>
<td>10.0</td>
<td>10.0</td>
<td>10.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Water (Soft)</td>
<td>83.0</td>
<td>83.0</td>
<td>81.0</td>
<td>81.0</td>
<td>81.0</td>
</tr>
</tbody>
</table>
7. Thick water in oil furniture polish: -

Polyethylene Wax 2.0  
Modified montan Wax 2.0  
Fatty alcohol 1.3  
Ethylene oxide derivative 1.2  
Deionised water 34.0  
White spirit 38.0  
Turpentine oil 20.0  
Silicone oil 350 1.5  
Perfume 9.5

8. Dry bright polymer emulsion shoe polish (non scuff type):

Polyethylene latex (15% solids) 25%  
Methylmethacrylate emulsion 50%  
Polymer (15% solids)  
Shellac 3.75%  
Morpholine 0.65%  
Water 20.60%

9. Aerosol furniture polish:-  

Polyethylene Wax 1.80 parts  
Polyvinyl stearate 1.80 parts  
Silicone fluid 1.20 parts  
White spirit 25.20 parts  
Dichlorodifluoromethane 70.0 parts

10. Aerosol cleaner polishes:-  

Polyethylene Wax 3.00 parts  
Silicone fluid 2.00 parts  
White spirit 30.00 parts  
Perfume Small quantity  
Dichlorodifluoromethane 65.00 parts
6.5. Assessment of demand

The present demand for Polyethylene Wax is around 1500 tonnes per annum and is entirely met by imports from Japan, USA, Germany, Canada and others.

6.6. Growth rate in demand

The growth rate in demand for Polyethylene Wax would depend upon the performance of the industrial sectors such as coatings, ink, adhesives and others, whose performance in turn would depend upon the overall growth of the national economy.

Considering the above aspects, the growth rate in demand for Polyethylene Wax can be reasonably considered as 9 to 10% per annum.
SECTION VII

BROAD OUTLINE OF MANUFACTURING PROCESS

General details

The Polyethylene Wax are made either by high pressure polymerisation, low pressure polymerisation or controlled thermal degradation of high molecular weight Polyethylene.

Polyethylene wax can be manufactured using either Polyethylene or from ethylene itself. This is high pressure reaction.

It is claimed that the technology has been developed by an American company based on usage of Scrap HDPE and LDPE as the raw material.

Process routes

1. Polyethylene Wax by synthesis

Polymerisation

\[ \text{CH}_2 = \text{CH}_2 \text{---------------------} \rightarrow \text{--(-CH}_2\text{-CH}_2\text{--)}_n \text{----} \]

Monomer PE Wax

Manufacturers: Allied Signal (USA), Mitsui (Japan), Hoechst & BASF(Germany).

2. Polyethylene Wax by degradation

Thermal cracking

\[ \text{--(-CH}_2\text{-CH}_2\text{--)}_n \text{--} \text{---------------------} \rightarrow \text{--(CH}_2\text{-CH}_2\text{--)}_n \text{--} \]

Polyethylene PE Wax

As opposed to continous process technology, batch technology process is cost effective and is based on the thermal cracking method. This process is reported to be successfully running at Yang-Lim, Korea.

This process also yields secondary products namely wax gel and wax emulsion, which can be used as anti setting agent for paints, gravure ink and water based emulsion for textile softener.
### Source of technology

* Inko Company Private Ltd.  
  Mathew Mansion, 8B, Eagle Street Cross,  
  Langford Town,  
  Bangalore 560025

### Major plant & machinery and suppliers

<table>
<thead>
<tr>
<th>Category</th>
<th>Supplier Name</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main storage tank</td>
<td>Aristo Engineers</td>
<td>J-3, Vikas Udyog Nagar, Behind Kasturi Tiwer, Phatak-Goddeo Road, Bhayander (E), Thane-401 105</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Abhinav Polymers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A/2, 3909, GIDC Estate, Phase - IV, Vatva, Ahmedabad-382 445</td>
</tr>
<tr>
<td>Reactor</td>
<td>Chemitherm Plants &amp; Systems P. Ltd., 30, Anandha Street</td>
<td>Alwarpet, Chennai-600 018</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Texel Fabricators Pvt. Ltd., 335, Sidco Industrial Estate, Ambattur, Chennai-600 098, Tamil Nadu</td>
</tr>
<tr>
<td>Electrical heating arrangement</td>
<td>Aero Therm Systems Pvt. Ltd., Plot No,1517, Phase – III</td>
<td>GIDC, Vatwa, Ahmedabad – 382 445</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Energy Machine</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C1, B/423, GIDC, IV- Phase, Vithal Udyognagar, Dist.Anand, Gujarat</td>
</tr>
</tbody>
</table>
| Blower                          | Air Control & Chemical Engineering Co.Ltd          | Lakshmi Bhavan (Vth Floor)  
  609, Anna Salai, Chennai-600 006                                         |
|                                 |                                                    | The Andrew Yule & Company Ltd.  
  Electrical Division: Transformer & Switchgear Unit  
  5/346, Old Mahabalipuram Road, Perungudi, Chennai-600 096                 |
SECTION VIII

RAW MATERIAL REQUIREMENTS, UTILITY AND AVAILABILITY

Raw materials

Raw material
- HDPE (high density polyethylene)
- LDPE (low density polyethylene)
- PP (polypropylene)

Raw material requirement

Yield
- 92.5 to 93%

Basis
- One tonne of Polyethylene wax

Polyethylene
- 1.2 tonnes

Utilities

Basis
- One tonne of Polyethylene wax

Power
- 300H.P.

Fuel
- 160 litres

Raw material availability

There is no constraint in the availability of raw material from indigenous sources.
SECTION IX

GLOBAL SCENARIO

One of the main wax types used today are the low molecular weight Polyethylenes, both homopolymers and their partially oxidised derivatives. Low molecular weight would be defined by a number average ranging from 2000 to 5000 approximately.

This level is, of course, considerably higher than paraffins, microcrystallines and F-T waxes. This difference renders them tougher and this, in conjunction with their varying hardness and slip characteristics makes them ideal additives in inks and coatings. Use level could be roughly described as concentrations ranging from 0.25 to 5% on solids.

Because of the requirement of substantial plant investment, the number of plants producing low molecular weight polyethylenes have been limited. These polyethylenes are mainly produced in the United States, Japan, and Germany.

Global demand 0.15 million tonnes per annum

Global growth rate in demand 6 to 7% per annum

Global manufacturers include the following

* Allied Signal Laminate Systems Inc.,
  230, North Front Street,
  P.O. Box 1448,
  La Crosse, WI 54601

* Mitsui Petrochemical Industries Ltd.,
  P.O. Box 90, 3-2-5 Kasumigaseki,
  Chiyoda-ku, Tokyo 100

* Hoechst AG
  Societe Francaise Hoechst
  Division Chime-Tour Roussel Hoechsts Cedex 3
  92080 Paris-La-Defense, France

* BASF Aktiengesellschaft
  Carl Bosch Strasse 38
  Ludwigshafen 67056, Germany
* Huls AG
   (A Veba group of company)
   Referat 1122/84/45E
   D-45764 Marl, Germany

* Polioles, S.A. de C.V.
   Fernando Montes de Oca No. 71,
   Colonia Condesa, Mexico, D.F. 06140, Mexico.

* Eastman Chemical Co.,
   Post Box No. 431, Kingsport, TN-37662

* Honeywell Speciality Chemicals,
   101, Columbia Road,
   Marris Town, NJ-07962

* Creanova Inc.
   220, Davidson Avenue,
   Somerset, NJ-08873
SECTION X
DISCUSSIONS ON ECONOMIC CAPACITY, PROJECT COST AND PROFITABILITY PROJECTIONS

Economic capacity : 1500 tonnes per annum
Project cost : Rs.636 lakhs

Assessment of project cost

1. Land

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Cost of land of 2 acre at Rs.5.5 lakh per acre</td>
<td>11.00</td>
</tr>
<tr>
<td>1.2</td>
<td>Cost of levelling, laying internal roads/fencing and compound wall</td>
<td>1.10</td>
</tr>
<tr>
<td></td>
<td><strong>Subtotal</strong></td>
<td><strong>12.10</strong></td>
</tr>
</tbody>
</table>

2. Building

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>Factory building of area 600 sq.m. at Rs.3200/sq.m.</td>
<td>19.20</td>
</tr>
<tr>
<td>2.2</td>
<td>Non-factory building of area 150 sq.m. at Rs.4500/sq.m.</td>
<td>6.75</td>
</tr>
<tr>
<td></td>
<td><strong>Subtotal</strong></td>
<td><strong>25.95</strong></td>
</tr>
</tbody>
</table>

3. Cost of Plant & Machinery

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td>Cost of basic plant and machinery</td>
<td>140.00</td>
</tr>
<tr>
<td>3.2</td>
<td>Instrumentation and control</td>
<td>10.50</td>
</tr>
<tr>
<td>3.3</td>
<td>Pipelines and valves</td>
<td>14.00</td>
</tr>
<tr>
<td>3.4</td>
<td>Structurals for erection</td>
<td>7.00</td>
</tr>
<tr>
<td></td>
<td><strong>Subtotal</strong></td>
<td><strong>171.50</strong></td>
</tr>
<tr>
<td>3.5</td>
<td>Octroi, excise duty, sales tax, etc. at 12%</td>
<td>20.58</td>
</tr>
<tr>
<td>3.6</td>
<td>Packaging and insurance charges (2%)</td>
<td>3.43</td>
</tr>
<tr>
<td>3.7</td>
<td>Transportation charges (2%)</td>
<td>3.43</td>
</tr>
<tr>
<td>3.8</td>
<td>Machinery stores and spares (2%)</td>
<td>3.43</td>
</tr>
<tr>
<td>3.9</td>
<td>Foundation charges (2%)</td>
<td>3.43</td>
</tr>
<tr>
<td>3.10</td>
<td>Installation charges (2%)</td>
<td>3.43</td>
</tr>
<tr>
<td></td>
<td><strong>Total cost of plant and Machinery</strong></td>
<td><strong>209.23</strong></td>
</tr>
</tbody>
</table>
4. Technical know-how fees Rs.60 lakhs

5. Miscellaneous fixed assets

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Description</th>
<th>Cost Rs.in lakhs</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1.</td>
<td>Electrification</td>
<td>15.00</td>
</tr>
<tr>
<td>5.2.</td>
<td>Steam boiler and auxillaries</td>
<td>30.00</td>
</tr>
<tr>
<td>5.3.</td>
<td>Water storage tank, borewell etc.</td>
<td>8.00</td>
</tr>
<tr>
<td>5.4.</td>
<td>Fuel storage tank</td>
<td>7.00</td>
</tr>
<tr>
<td>5.5.</td>
<td>Laboratory equipment</td>
<td>6.00</td>
</tr>
<tr>
<td>5.6.</td>
<td>Office machinery &amp; equipment</td>
<td>5.00</td>
</tr>
<tr>
<td>5.7.</td>
<td>Material handling equipment, packaging machinery, weigh balance, etc.</td>
<td>4.00</td>
</tr>
<tr>
<td>5.8.</td>
<td>Diesel generator</td>
<td>15.00</td>
</tr>
<tr>
<td>5.9.</td>
<td>Effluent treatment</td>
<td>9.00</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>99.00</td>
</tr>
</tbody>
</table>

6. Preliminary & Pre-operative expenses:

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Description</th>
<th>Cost Rs.in lakhs</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1.</td>
<td>Preliminary expenses</td>
<td>10.00</td>
</tr>
<tr>
<td>6.2.</td>
<td><strong>Pre-operative expenses:</strong></td>
<td></td>
</tr>
<tr>
<td>6.2.1</td>
<td>Establishment</td>
<td>5.00</td>
</tr>
<tr>
<td>6.2.2</td>
<td>Rent rates and taxes</td>
<td>5.00</td>
</tr>
<tr>
<td>6.2.3</td>
<td>Travelling expenses</td>
<td>8.00</td>
</tr>
<tr>
<td>6.2.4</td>
<td>Interest and commitment charges on borrowings</td>
<td>12.00</td>
</tr>
<tr>
<td>6.2.5</td>
<td>Insurance during construction period</td>
<td>8.00</td>
</tr>
<tr>
<td>6.2.6</td>
<td>Other preoperative expenses and deposits</td>
<td>-</td>
</tr>
<tr>
<td>6.2.7</td>
<td>Interest on deferred payment</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>48.00</td>
</tr>
</tbody>
</table>

7. Provision for contingency Rs. 31.22 lakhs

8. Working capital margin Rs. 150.52 lakhs

9. Total project cost Rs.636 lakhs

10. Means of Finance

Promoter's contribution Rs. 254 lakhs
Term loan from financing institutions Rs.382 lakhs
Total project cost Rs.636 lakhs
### 11. Financial statements

<table>
<thead>
<tr>
<th>A</th>
<th>Variable cost (Rs. in lakhs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw material and utilities</td>
<td>1374.90</td>
</tr>
<tr>
<td>Spares and maintenance</td>
<td>12.55</td>
</tr>
<tr>
<td>Selling expenses</td>
<td>97.50</td>
</tr>
<tr>
<td>Total variable cost (A)</td>
<td>1484.95</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B</th>
<th>Fixed cost (Rs. in lakhs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salaries and wages</td>
<td>12.00</td>
</tr>
<tr>
<td>Interest on term loan and working capital loan</td>
<td>149.97</td>
</tr>
<tr>
<td>Depreciation</td>
<td>29.63</td>
</tr>
<tr>
<td>Administrative expenses</td>
<td>58.50</td>
</tr>
<tr>
<td>Total fixed cost (B)</td>
<td>250.10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C.</th>
<th>Total cost of production (A+B) (Rs. in lakhs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>D.</td>
<td>Selling price per kg. (in Rupees) (Rs.)</td>
</tr>
<tr>
<td>E.</td>
<td>Annual sales turnover (Rs.)</td>
</tr>
<tr>
<td>F.</td>
<td>Net profit before tax (E-C) (Rs.)</td>
</tr>
<tr>
<td>G.</td>
<td>Breakeven point in %</td>
</tr>
</tbody>
</table>
## SECTION XI

### SWOT ANALYSIS

<table>
<thead>
<tr>
<th>Strength</th>
<th>Product relevance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Growth in demand</td>
</tr>
<tr>
<td>Weakness</td>
<td>Low Indian demand level</td>
</tr>
<tr>
<td></td>
<td>Absence of Indian producer</td>
</tr>
<tr>
<td>Opportunity</td>
<td>Raw material availability</td>
</tr>
<tr>
<td>Threat</td>
<td>Supply by major global producers from abroad</td>
</tr>
</tbody>
</table>
SECTION - XII

FACTORS INFLUENCING THE POSITION FOR A NEW INDUSTRY AND RECOMMENDATIONS

Polyethylene Wax is an important constituent, in the formulation of coatings, inks adhesives, etc.

As there is no producer of Polyethylene Wax in the country at present, there is total gap in the supply for the product in India, which is entirely met by imports.

Polyethylene Wax project can be ideally set up by thermal cracking process, and is an excellent opportunity for investment in the country.