

# Intermediates

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## Food Grade Hexane by Solvent Extraction Process

### DESCRIPTION

- Food grade hexane by solvent extraction process; byproduct high aromatic naphtha
- No extra measures are required to those that are already in place to ensure environment compliance

#### Advantages

- The aromatic rich solvent is further processed to recover solvent and high aromatic Naphtha
- Process accepts feed with high benzene content
- Estimated investment for a battery limit plant of 25000 TPA is around Rs 15 million

#### Target Countries

- South America
- Africa
- Other developing countries

#### Applications

- For extraction of vegetable oils

- **Current stage of development**  
Process standardised on pilot scale
- **Collaboration options**  
Technology Transfer

#### SPECIFICATIONS

##### Raw materials

Raw hexane cut with any benzene content  
Sulpholane

##### Equipment

Extractor  
Solvent recovery column  
Raffinate wash column  
Solvent regenerator

#### Organisation

Indian Institute of Petroleum

#### Cross Reference

Organisation Page 160

## Menthol Production

### Process Optimised to Extract Menthol from Mentha Arvensis Oil

### DESCRIPTION

- Process optimised to extract menthol from Mentha Arvensis oil under description
- The process involves the progressive cooling of oil resulting in the separation of 63-65% menthol in crystalline form. The crystals are further processed to obtain bolder crystals
- No special measures are required for environment compliance

#### Advantages

- Process enables further recovery of menthol from the dementholised oil there by improving the overall yield and economics
- Estimated investment for a battery limit plant of 15 TPA is around Rs. 1.2 million

#### Target Countries

- All countries

#### Applications

- Menthol's refreshing aroma and cooling action, along with its stimulant and anti-septic qualities have led to its widespread use for medicinal purposes in pharmaceuticals and cosmetics

#### Current stage of development

Formulation has been standardized at laboratory level

#### Collaboration options

Technology Transfer

#### SPECIFICATIONS

##### Raw materials

Mentha arvensis oil  
Alkali  
Solvent  
Acid

##### Equipment

Hydrolysis unit  
Fractionating column  
Separators  
Vacuum pump  
Boilers Chillers, Centifuge

#### Organisation

Regional Research Laboratory (RRL-JM)

#### Cross Reference

Organisation Page 169

# Improved Process of Dyeing Polyester and its Blends

## DESCRIPTION

- Short dyeing cycle
- Increase levelness
- Low effluent load
- Reduction in processing cost

### Advantages

- Better fabric quality
- Dyeing cost reduced by about 20% compared to conventional method of dyeing

### Target Countries

- Bangladesh
- African countries
- China
- Nepal
- Sri Lanka

### Applications

- In Yarn Dyeing (H.T.H.P. PACKAGE DYEING MACHINE) Nylon, Wool, Acrylic polyester in blends
- Fabric Dyeing in HTHP MACHINE
- Narrow Fabric Manufacturer in dyeing continuous stage for better penetration
- Textile Processing

- **Current stage of development**  
Commercialised
- **Collaboration options**  
Joint venture, Commercial agreement with technical assistance
- **IPR details**  
Secret know-how

### Organisation

Mafatlal Dyes & Chemicals Limited

### Cross Reference

Organisation Page 163

# Low-Cost Hexamine Production Technology

## DESCRIPTION

- Reaction of Formaldehyde and Ammonia by evaporation, crystallisation and certerfusing drying
- Continuous plant producing 15 tons per day of Hexamine

### Advantages

- Lower power consumption
- Low consumption of the steam
- Cheaper and smaller in size vis-à-vis those offered by the European manufacturers
- Simple to operate

### Target Countries

- China and Far-East
- Middle East
- Africa

### Applications

- Raw material in slurry explosives, manufacture of a blowing agent for rubber, and Dinitrosopentamethylene tetramine, and catalyst in manufacture of Bakelite molding powder
- Applicable in upstream and downstream integration

- **Current stage of development**  
Commercialised
- **Collaboration options**  
Open to negotiations of all kinds

## SPECIFICATIONS

Capacity	15 tons per day
Capital expenditure	US\$ 0.75 million
Operating costs	\$100 per ton of finished good

### Organisation

Simalin Chemical Industries Ltd.

### Cross Reference

Organisation Page 174

# Pyridine & 3-Picoline

## Synthesis from Acetaldehyde, Formaldehyde and Ammonia

### DESCRIPTION

- Catalytic process using specially designed catalyst to reduce formation of non-useful higher bases like Lutidines and collidines, thereby simplifying the separation problem
- Needs appropriate disposal systems

#### Advantages

- The product meets the stringent specifications of pharmaceutical and agro-chemical industries
- Estimated investment for a battery limit plant of 100 kg/day is around Rs. 3 million. Production cost is around Rs 80/kg

#### Target Countries

- China
- South American countries
- African countries
- Indonesia

#### Applications

- Pyridine and 3-Picoline find wide application in the agro-chemical, rubber and dye-industries
- Pyridine is used in sulpha drugs and antihistamines and stimulants. 3-Picoline is used in Nicotinamide and Coramine

- **Current stage of development**  
Standardised at laboratory scale
- **Collaboration options**  
Technology Transfer

#### SPECIFICATIONS

##### Raw materials

Acetaldehyde  
Formaldehyde and  
Ammonia

##### Equipment

General equipment required  
for a chemical plant.

#### Organisation

Central Fuel Research Institute

#### Cross Reference

Organisation Page 145

# Sodium Azide Production Technology

### DESCRIPTION

- Aqueous solution of Sodium nitrite is reacted with alcoholic Sulphuric acid solution to obtain Ethyl nitrite, which is reacted with alkaline Hydrazine hydrate to form Sodium azide
- Needs appropriate effluent disposal systems

#### Advantages

- Estimated investment for a battery limit plant of 1 TPD is around USD 1 million

#### Target Countries

- South East Asia
- China
- Other developing countries

#### Applications

- Used for preparation of hydrazoic acid, pure sodium and as an intermediate in explosive manufacture

- **Current stage of development**  
Process standardised at pilot scale.
- **Collaboration options**  
Technology Transfer

#### SPECIFICATIONS

##### Raw materials

Sodium nitrite  
Ethyl alcohol  
Sulphuric acid  
Hydrazine hydrate  
Sodium hydroxide

##### Equipment

General equipment required  
for a chemical plant

#### Organisation

Indian Institute of Chemical Technology

#### Cross Reference

Organisation Page 159

# Anaerobic Adhesives

## Formulations Based on Polyhydric Alcohol Esters Monomers

### DESCRIPTION

- The monomers for the adhesives are prepared by the esterification of Polyhydric alcohols with Methacrylic acid using suitable catalysts and then subsequent treatment yields a product of over 90% purity, is suitable for making anaerobic adhesive compositions
- No special measures are required for environmental compliance

### Advantages

- Estimated investment for a battery limit plant of 1 TPD is around USD 0.1 million

### Target Countries

- Europe
- USA

### Applications

- Aircraft industry structural bonding in aircrafts as pipe sealants
- Bonding gasket eliminators in automobile industry
- Maintenance and repair work

- **Current stage of development**  
Process standardised at pilot scale
- **Collaboration options**  
Technology Transfer

### SPECIFICATIONS

#### Raw materials

Polyethylene glycols  
Methacrylic acid  
Hydro peroxides  
Quinones  
Tertiary amines

#### Equipment

S.S. Reactors  
Filter Press

### Organisation

Indian Institute of Chemical Technology

### Cross Reference

Organisation Page 159

# Trimethyl Phosphite

## Production from Phosphorous Trichloride & Methanol

### DESCRIPTION

- Produced by reacting Phosphorous trichloride and Methanol in presence of a solvent and an acid scavenger. The resultant slurry is neutralized by alkali solution to separate the organic layers and the aqueous layer. The pure TMP product is recovered from Organic layer comprising TMP, solvent and DMA
- Needs appropriate effluent disposal systems

### Advantages

- Estimated investment for a battery limit plant of 5 TPD is around USD 15 million

### Target Countries

- China
- India
- USA

### Applications

- A key intermediate in the manufacture of several organophosphatic pesticides like Monocrotophos, DDVP, Phosphomidon etc
- A reagent in organic synthesis, as plasticiser for nylon
- A raw material in the production of fire resistant and fire retardant materials

- **Current stage of development**  
Process standardised at pilot scale
- **Collaboration options**  
Technology Transfer

### SPECIFICATIONS

#### Raw materials

Phosphorous trichloride  
Methanol  
Ammonia  
DMA  
Solvent (trimethoxy benzene).

#### Equipment

General equipment required for any chemical plant

### Organisation

Indian Institute of Chemical Technology

### Cross Reference

Organisation Page 159

# Turbula

## A Shaker Mixture to Homogeneously Mix Chemicals

### DESCRIPTION

- It charges chemicals with different specific weights and sizes by mixing them evenly in a closed container. The technology makes it permissible to mix wet and dry components
- The mixture container gyrates in 3 dimensional movements

#### Advantages

- The production process is dust free and hygienic, and the design allows Turbula to be cleaned easily
- The rhythmic and pulsing motion is in three dimensions

#### Target Countries

- Korea
- Singapore
- China
- South Africa

#### Applications

- Applicable to chemical, pharma, R&D labs, testing Labs, food product, bearing and textiles industries

#### Current stage of development

Commercialised

#### Collaboration options

Joint venture and Marketing agreement

#### Organisation

Hetal Chemicals

#### Cross Reference

Organisation Page 156

# DI OCTYL PHTHALATE (DOP)

### DESCRIPTION

- It is the most common plastisier used for PVC Compounding/processing. It is compatible with PVC, Vinyl co-polymers, Polystyrene, Poly methyl mathacrylates, Nitro cellulose, Ethyl cellulose etc. It plasticises Cellulose aceto butyrate producing soft films

#### Advantages

- Low volatility excellent compatibility
- Permanent flexibility
- Low temperature applications
- Heat ultra-violet resistance

#### Target Countries

- All countries

#### Applications

- Extrusions, sheetings and films
- Cable industry

#### Current stage of development

Commercialised

#### Collaboration options

Marketing agreement

### SPECIFICATIONS

Colour	Apha 40 Max.
Heat stability (colour)	Apha 60 Max.
Specific gravity (20C)	0.982 Min. // 0.986 Max.
Water content (% by weight)	0.05 Max.
Acidity (as parent acid)	0.01 Max.
Ester content	99.3% Min.

#### Organisation

Ashok Organics Industries Ltd.

#### Cross Reference

Organisation Page 142

# Nylon Tyre Cord Production

## DESCRIPTION

- Raw material Caprolac is converted to Nylon B chips (polymer) which is spun into yarn through melt spinning process. This yarn is converted through twisting/ weaving process into nylon tyre cord fabric

### Advantages

- Reinforcement material
- Low cost product

### Target Countries

- USA
- Europe
- Developing countries

### Applications

- Tyre domains

- Current stage of development**  
Commercialised
- Collaboration options**  
Technical co-operation
- IPR Details**  
Secret know-how

### Organisation

SRF Limited

### Cross Reference

Organisation Page 172

# Ethanol Production from Molasses

## DESCRIPTION

- Process uses *saccharomyces cerevisiae*, with pronounced osmotolerant and ethanol tolerant properties. It tolerates high initial sugar levels of 25-30% in the fermentation broth resulting in the production of 10-13% V/V ethanol, in the course of 30-40 hours with conversion efficiency of over 90%
- Easily adoptable by existing distilleries

### Advantages

- Extra investment for an existing 30 kL/day capacity plant is about USD 0.02 million
- Payback period is around one year
- Net saving of 0.6-0.8 kg steam per litre of alcohol produced

### Target Countries

- All countries

### Applications

- Ethanol is a basic raw material for the production of many important chemicals and pharmaceuticals

- Current stage of development**  
Process standardised on commercial scale in two distilleries
- Collaboration options**  
Technology Transfer

## SPECIFICATIONS

### Raw materials

Molasses

### Equipment

Minor modifications in existing plant/ equipment

### Organisation

Institute of Microbial Technology

### Cross Reference

Organisation Page 162

# Eco Friendly Production of Sodium Ferrocyanide

## DESCRIPTION

- Yellow crystalline, free flowing, dry product
- Prepared by the reaction of Sodium cyanide with Ferrous salt
- Production capacity of 500 kg/ day at Baroda complex

### Advantage

- Minimum 99.0% purity of this stable compound at normal temperature

### Target Countries

- China
- South America
- All developing countries

### Applications

- Manufacture of Sodium ferricyanide
- Blue pigments
- Blue print paper
- Photography
- Manufacture of aniline black
- Metal and leather tanning industry
- Dyeing industry
- Anticaking agent
- Biochemical processes

- **Current stage of development**  
Commercialised
- **Collaboration options**  
Marketing agreement
- **IPR Details**  
Secret know-how

### SPECIFICATIONS

1. Assay (as $\text{Na}_4\text{Fe}(\text{CN})_6 \cdot 10\text{H}_2\text{O}$ )	% 99.0 min
2. Sulphate (as $\text{SO}_4$ )	% 0.1 max

### Organisation

Gujarat Alkalies & Chemicals Ltd.

### Cross Reference

Organisation Page 153

# Nonyl Phenol Intermediate in Synthesis of Non-Ionic Surfactants, Plasticizers and Polyurethane

## DESCRIPTION

- Manufactured by alkylation of Phenol with Nonene in presence of ion-exchange resin catalyst
- Manufacturing facilities has both continuous and batch ways ensuring a mix of flexibility and consistency

### Advantages

- Para content of over 93% even for the technical grade against Dow's specification of 92% (min)
- Colour of 10-15 Apha (white filling) as against Dow's specification of 30 Apha
- Phenol content of <500 ppm against Dow's specification of 1000 ppm
- Cost competitive due to economies of scale

### Target Countries

- All countries

### Applications

- Textile auxiliaries
- Polyol manufacture
- Emulsifiers
- Surfactants
- Plastic Additives

- **Current stage of development**  
In industrial use
- **Collaboration options**  
Marketing agreement
- **IPR details**  
Secret know-how  
Trademark: "Herdillia"

### SPECIFICATIONS

Appearance	Clear Viscous Liquid without sediments
Colour, HU, (max.)	50
Purity, Percent by mass, (min.)	99
Dinonyl phenol, Percent by mass, (max.)	1.0
Phenol, percent by mass, (max.)	0.1
Water content, percent by mass, (max.)	0.05
Specific gravity, 27C/ 27C	0.945
Hydroxyl value, mg KOH/gm	248
Distillation range, initial boiling point, C	288
95% to distill, C	310

### Organisation

Schenectady Herdillia Limited

### Cross Reference

Organisation Page 173



# PAVS

## Vinyl Sulphone Ester Para Anisidine Base

### DESCRIPTION

- Speciality in Vinyl sulphone based derivatives and has capacity to manufacture about 180 MT/month of Vinyl sulphone derivatives with various bases
- Only company in India which can produce and deliver Vinyl sulphone based on Ortho anisidine and Para anisidine

#### Advantages

- Value-added high-quality product to match international standards
- Min. 97% purity

#### Applications

- Dye Intermediate (speciality blue dyes)

#### Target Countries

- China
- African countries
- Other developing countries

- **Current stage of development**  
In industrial use
- **Collaboration options**  
Marketing agreement

#### SPECIFICATIONS

Mol. Wt	311
Physical appearance	Off white powder
Form	Dry powder
% Strength	Min 95% by N.V.
pH	Acidic
Insolubles	± 0.3%
Solubility	Light alkaline media

#### Organisation

Reliable Dye Chem Private Ltd.

#### Cross Reference

Organisation Page 170

# Ammonium Persulphate (Ammonium Peroxy Di-Sulphate) Oxidising Agent

### DESCRIPTION

- Water soluble, odourless white granular powder decomposed in the presence of moisture to produce Ozone and Ammonium pyrosulphate
- Strong oxidising agent

#### Advantages

- Stable
- Water soluble
- No environment issues
- Available oxygen of 7%

#### Target Countries

- USA
- Europe

#### SPECIFICATIONS

Appearance	White granular powder
Odour	Odourless
M. formula	(NH <sub>4</sub> ) <sub>2</sub> S <sub>2</sub> O <sub>8</sub>
M. wt	228.21
Purity	98%
Sp. gravity	1.98
Stability	Good in absence of water
Environment liability	None

#### Applications

- Oil, soap and cotton industries for bleaching and oxidising
- In printed circuit boards, as copper oxidiser and zinc etching
- Dye industry manufacture of Aniline dyes
- Pharmaceutical industries manufacture of 3:4:5 Trimethoxy benzaldehyde and oxidation agent in Refampicin

- **Current stage of development**  
In industrial use

- **Collaboration options**  
Information exchange, Research, Technical co-operation

#### Organisation

Gujarat Persalts Private Limited

#### Cross Reference

Organisation Page 155

# Sodium Chlorite (50% / 80%)

## An Effective Bleaching Agent

### DESCRIPTION

- Effective and non-degrading method of bleaching man made fibres
- Water soluble, weakly hygroscopic flakes

#### Advantages

- Has better oxidising power than Hydrogen Peroxide
- Excellent bleaching that is maintained after resination
- Safely transported and it reacts to form Chlorine Dioxide at the bleaching site

#### Target Countries

- South East Asia
- USA
- Australia
- Africa (Ethiopia)

#### Applications

- Only effective bleaching agent that imparts permanent whiteness to man made fibre, cotton, fibre blends, blended fabrics, oils, and fats without degradation
- Used in metal cleaning, water purification and pulp bleaching
- Preparing of bleaching bath

- **Current stage of development**  
In industrial use
- **Collaboration options**  
Information exchange, Research, Technical co-operation

### SPECIFICATIONS

Appearance	White
Composition	Weakly hygroscopic flakes
Solubility	Hot and cold water
Stability	Good
pH	Alkaline
Environment liability	None

#### Organisation

Gujarat Persalts Private Limited

#### Cross Reference

Organisation Page 155

# Defoamer (Anti-Foaming Agent)

### DESCRIPTION

- Defoamer is a chemical, which suppresses the foam generated due to decomposition of carbonates when phosphate rock is acidulated with nitric acid or sulphuric acid
- The manufacturing process consists of two mixing vessels. The Ingredients used are surfactant, water, Additive-I Solution and Additive-II Solution. These are required in fixed proportions, depending upon the concentration of active matter in the surfactant for the desired quality of Defoamer Formulation to be prepared (at least 20% active matter)
- A defoamer plant (2.6 MT per batch) is working since January 2002

#### Advantages

- Improvement in quality of Defoamer (the specific consumption of defoamer has come down by 33%)

#### Target Countries

- China
- Indonesia
- USA
- Pakistan
- Other fertiliser manufacturing countries

#### Applications

- Useful in ANP, other complex fertilisers and Phosphoric acid plants (in all fertiliser plant)

- **Current stage of development**  
Commercialised
- **Collaboration options**  
Open to all options
- **IPR details**  
Secret know-how

### SPECIFICATIONS

pH	6.8 - 7.5
Specific gravity at R.T	1.05 - 1.10
Flash point (open cup)	> 175 °C
Viscosity	10 - 40 CPs
Active matter	20% +-5
Reduction in foam height	75%

#### Organisation

Rashtriya Chemicals and Fertilisers (RCF)

#### Cross Reference

Organisation Page 168