AIR LIQUIDE

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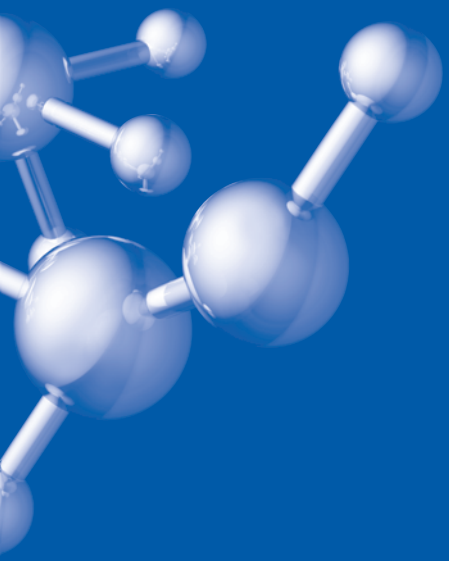


Lurgi DISTAPEX® Process

Recovery of Pure Aromatics

Phenole Plant, Mobile, USA

Introduction

Aromatics are key raw materials for the production of intermediates like styrene, phenol or cyclohexane and further on the basis to produce plastics, synthetic rubber and synthetic fibers used in various industrial applications.

Lurgi's proprietary DISTAPEX® process for recovering pure aromatics, particularly benzene, was developed in the 60s and continuously improved until now. During this period the process has proven itself in more than 20 plants. The overall installed capacity is more than 3.5 million tons of pure aromatics per year. The individual capacities are in the range of 20,000 up to 400,000 tons per year.

Today, the main sources for pure aromatics are pyrolysis gasoline obtained as by-product from naphtha-based steam cracking in ethylene plants and reformate occuring on catalytic reforming of naphtha.
The recovery from coal products presently plays only a minor role but is also possible.

Lurgi's Expertise

Lurgi can look back on more than 40 years experience in engineering, erection and commissioning of DISTAPEX® plants. Lurgi offers a wide range of services from studies for process optimization or expansions, basic and detail engineering through the turn-key erection of a DISTAPEX® plant.
Besides standard solutions Lurgi is prepared to offer tailor-made solutions to meet the specific requirements of its clients, e.g. optimizing the pretreatment of the feedstock. Furthermore, concepts to revamp or expand aromatic separation plants based on liquid-liquid extraction by combination with extractive distillation are available.

Solvent

Essential criteria for the characteristics of the solvent are:

- Capacity
- Selectivity
- Low boiling point
- Low solidification point
- Thermal and chemical resistance
- Corrosiveness
- Environmental compatibility
- Availability and price

Summation formula	C_5H_9NO
Molecular weight	99.1
Boiling point (760 mmHg)	203°C
Solidification point	-24°C
Flash point	91°C
Ignition temperature (DIN/ASTM)	245 / 270 °C
Density at 20°C	1.03 kg / l
pH in water	7.7 to 8
Appearance	colourless

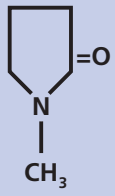
Required Plant Area

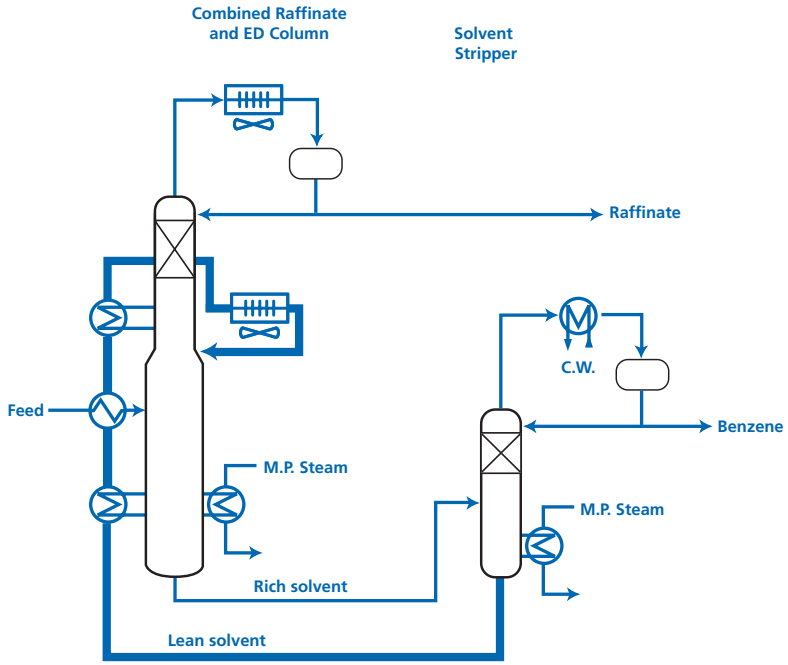
The space requirement of a DISTAPEX® plant producing 200,000 tons of benzene per year is about 1,200 m².

Advantages of the Lurgi DISTAPEX® Process

- Economic recovery of aromatics due to simple process design
- Minimized column dimensions due to solvent capacity and optimized operating pressures
- High purity and high yield of recovered aromatics
- Low utility consumption due to highly efficient heat integration
- Low process temperatures
- Low solvent consumption
- High thermal stability of solvent
- No corrosion problems, only carbon steel used
- No heat tracing for the solvent due to low solidification point
- No environmental problems due to closed solvent cycle
- High flexibility regarding feedstock
- High on-stream factor

N-methylpyrrolidone
(Abbr. NMP)





The DISTAPEX® Process

Process Description

The DISTAPEX® process is based on the principle of extractive distillation to separate aromatics and non-aromatics. N-methylpyrrolinone (NMP) is used as solvent.

The feedstock containing the aromatic compound to be recovered is routed to the middle of the extractive distillation column. The solvent NMP is fed at the top of the column. The aromatic components are concentrated in the solvent, withdrawn together at the bottom and routed to the stripper. Under vacuum conditions the aromatic component is separated from the solvent and recovered as pure overhead product. The solvent is recycled to the extractive distillation column.

To minimize the use of medium pressure steam (1.2-1.4 MPa) the heat available form the solvent is integrated to a maximum feasible extent.

At the top of the extractive distillation column small amounts of the solvent are recovered from raffinate in the packing section of the column.

The pressures and temperatures applied are moderate. The working pressures are above atmospheric or moderate vacuum in the stripper column and optimized for minimum column diameters. The maximum working temperatur on the product side is 175°C. Due to the favorable non-corrosive character of the solvent the overall plant can be made of carbon steel.

Depending on the feedstock composition one option could be include a predistillation of the feedstock upstream of the DISTAPEX® unit to remove higher boiling components. This is required if a hydrogenation unit or a clay treater is used upstream of the DISTAPEX unit.
Additionally, the specification of higher boiling components in the final product can be adjusted.

Haldia, Indien

Technical Data

Typical feedstock

Composition	Reformate	Pyrolysis Gasoline	Coke Oven Light Oil
Benzene	4	38	65
Toluene	17	20	18
Xylene	18	5	6
Etylbenzene/Styrene	5	4	2
Higher Aromatics	11	5	7
Non-Aromatics	45	28	2

Typical product specifications

The yield of recovered pure aromatics depends on the content of nonaromatic conponents in the feedstock. A typical value for recovery of benzene from pyrolysis gasoline is above 99.5 % at a benzene feed concentration above 80 %.

By-products

The produced raffinate can be blended, e.g. into steam cracker feedstock.

Utility consumption

Typical utility consumption per ton of product (configuration as shown in process flow diagram):

Electrical power	8 kWh
Steam (1.2 – 1.4 MPa)	0.7 t
Cooling water	19 m³
Solvent make-up	0.01 kg

Product specification

Benzene Product		
Destillation range @ 760 mm Hg and including 80.1°C solidification		1.0 (max), 5.45 (min)
Benzene	% wt	> 99.90
Toluene	ppm wt	< 300
Non aromatic HC	ppm wt	< 1000
Color, Pt-co-scale		< 20
Acidity		None
Total Chloride as Cl	ppm wt	< 3
Total Sulfur	ppm wt	< 1
Thiophene	ppm wt	< 0.6
CS2	mg/l	< 5
Acid wash color, APAH		< 1
Copper corrosion		Pass 1a or 1b
Appearance		Clear
Moisture / water content	ppm wt	< 30
NMP	ppm wt	< 10
Sp. gravity	g/cm³	0.882-0.886

Lurgi is a leading technology company operating worldwide in the fields of process engineering and plant contracting. Based on syngas, hydrogen production and clean conversion technologies for fuels or chemicals Lurgi offers innovative solutions that allow the operation of environmentally compatible plants with clean and energy-efficient production processes.
Its technological leadership is based on proprietary and exclusively licensed technologies which aim to convert all carbon energy resources (oil, coal, natural gas, biomass, etc.) in clean products.

Lurgi is a member of the Air Liquide Group.

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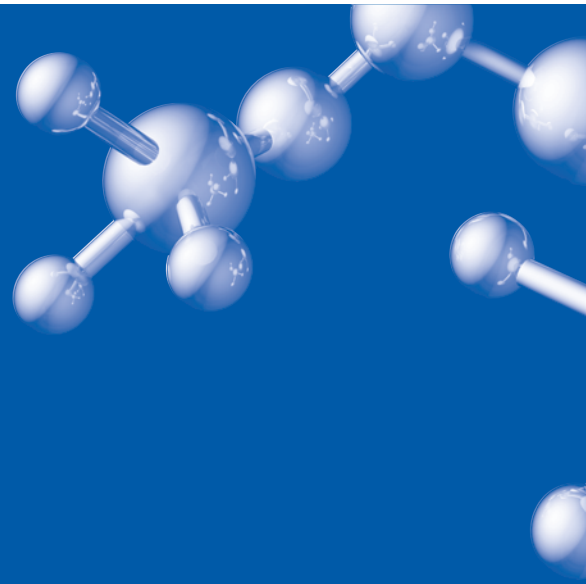

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