PHENOL
BUSINESS UNIT

CEPSA

PHENOL BUSINESS UNIT

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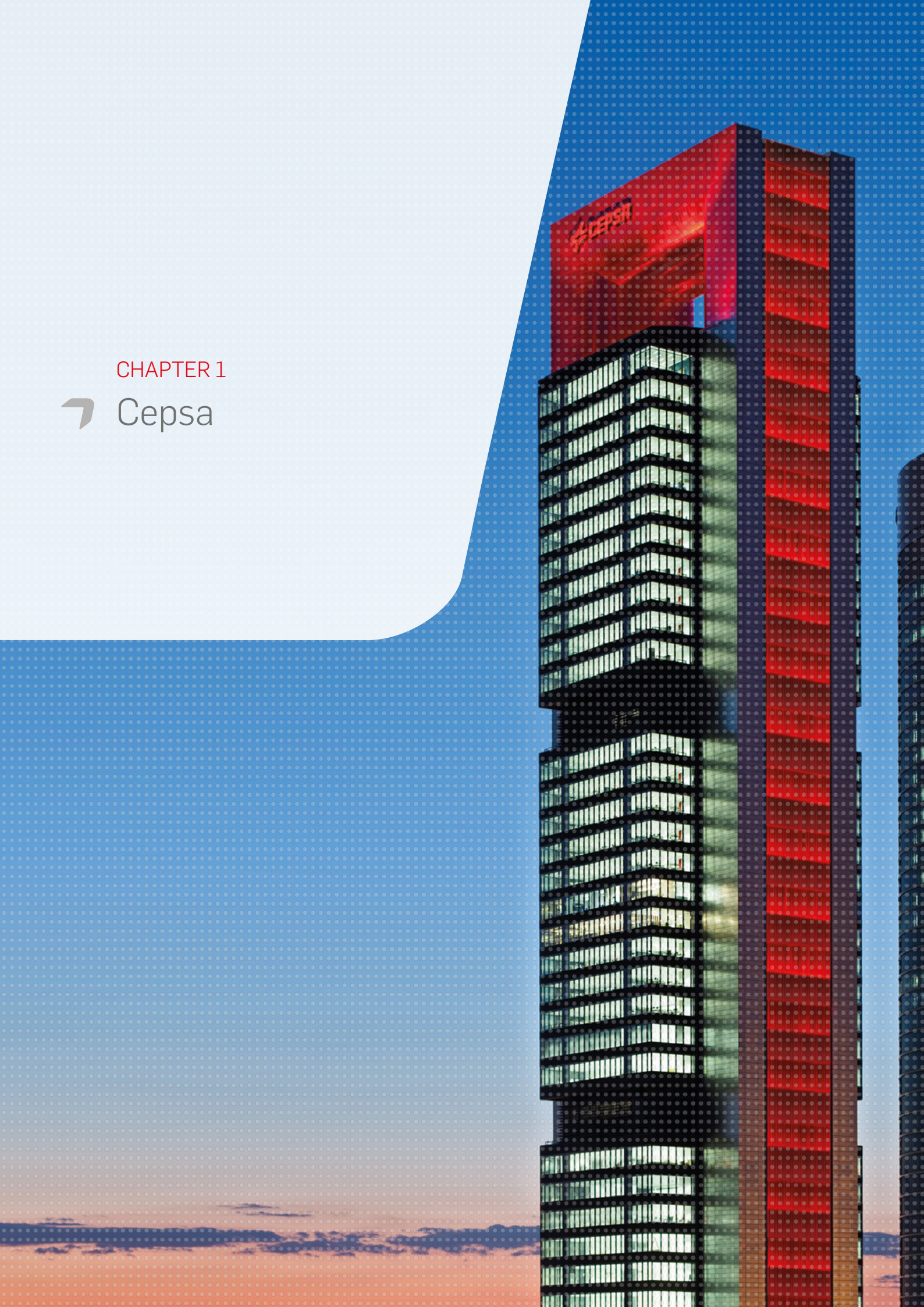
INDEX

CHAPTER 1

Cepsa



Our aim is to achieve a powerful position in the global energy market.

We are a global energy company, which operates in an integrated manner at all stages of the hydrocarbon value chain as well as manufacturing products from plant-based raw materials and having a presence in the renewable energy sector. Mubadala Investment Company, one of the world's largest sovereign wealth funds, is our sole shareholder.

Cepsa has more than 85 years of experience and a team of around 10,000 professionals pursuing technical excellence and highest resilience capacity to the always changing environment. It is present on all five continents through its Exploration and Production, Refining, Chemical, Marketing, Gas and Electricity, and Trading divisions.

We have developed an important chemical division that is closely integrated with the refining business where we manufacture and market raw materials to make high value added products.

With the dynamic and innovative spirit that characterizes us, we pursue continuous improvement in the search for new goals and challenges, while maintaining our firm commitment to maximum customer satisfaction, adapting energy to their needs.

Thanks to our integrated business model, our technical excellence and ability to adapt, we have consolidated our position as a leading company nationally, and our aim is to achieve an important position in the global energy market.

Around the world

"We are an integrated energy company with nearly 10,000 professionals, with experience in the industry, and we are present in all phases of the petroleum and gas value chain."

- UPSTREAM
- E EXPLORATION
- P PRODUCTION
- REFINING
- DISTRIBUTION AND MARKETING
- CHEMICALS
- GAS AND POWER
- CORPORATE HEADQUARTERS
- TRADING AND BUNKER


BELGIUM AND NETHERLANDS
GERMANY
UNITED KINGDOM
PORTUGAL
MOROCCO
CHINA
INDONESIA
E
P
KENYA
E
MALAYSIA AND THAILAND
U.A.E.
E
P
ITALY
ALGERIA
E
P
SPAIN
E
P
ANDORRA AND GIBRALTAR

CHAPTER 2

Chemicals at Cepsa

Cepsa's Chemicals is fundamental to the internationalization and growth of the Company.

Our business in chemicals is well renowned both in national and international markets, where it sells its products manufactured at our chemicals plants and refineries.

We produce high added value products that are used as raw materials in multiple industries and have a large number of end uses: state-of-the-art plastics, biodegradable detergents, personal care products, paints or synthetic fibers among others.

We carry out marketing through strategically located sales offices and subsidiaries, and we have an extensive global distribution network, with our own storage tanks and loading platforms at the production sites and at different terminals, to ensure optimum delivery to customers.

Global leadership through an integrated and diversified portfolio:

- Raw materials for detergents (LAB/LABSA & Alcohols)
- Raw material for high tech plastics (Phenol and acetone).
- Solvents (raw materials for paints, printing dies, cosmetics and adhesives, lacquers, varnishes, and pharmaceutical products).

Global presence of chemicals business at Cepsa

(Plants capacity in kt)

Becancour (Canada)**: 100%**
LAB: 120

Palos de la Frontera (Spain)**: 100%**
Cumene: 1,000 / Phenol: 600 /
Acetone: 370 / AMS: 24

Camaçari (Brazil)**: 72%**
LAB: 260 / LABSA: 120

Shanghai (China)**: 75%**
Cumene: 360 / Phenol: 250 /
Acetone: 150

Dumai (Indonesia)**: 50%**
Fatty alcohols: 160

Puente Mayorga (Spain)**: 100%**
LAB: 220 / LABSA: 80 / N-Paraffins: 400

Genthin (Germany)**: 50%**
Surfactants: 100

- **Sales offices:**
  Netherlands, Belgium, UK, Italy, USA

CHAPTER 2

Chemicals at Cepsa

CHAPTER 3

Phenol Bussines Unit

3.1. Industrial Sites:

Phenol Business unit has two production sites: Huelva (Spain) and Shanghai (China).

Both plants use state of the art Exxon Mobil Technology for the production of cumene and UOP technology in the production of phenol and acetone.

Cepsa is the largest cumene producer in the world, being one of the main players in the market and the second phenol manufacturer worldwide.

Production site in Huelva is the biggest integrated Phenol and Cumene plant in the world. We also produce Alpha-methyl Styrene (AMS) as a valuable by-product.

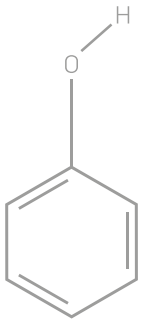
Cyclohexane is produced in La Rábida Cepsa Refinery (Huelva, Spain) and commercialized under Phenol Business Unit.

	Cumene (kt/y)	Phenol (kt/y)	Acetone (kt/y)	AMS (kt/y)	Cyclohexane (kt/y)
Spain	1000	600	370	24	180
China	360	250	150	-	-

- Headquarters in Madrid
- Sales offices in Netherlands

3.2. Phenol at a glance, simplified chemistry:

- **Chemical Names:**
  Phenol; Carbolic acid; Hydroxybenzene
- **Molecular Formula:**
  C_6H_5OH
- **Molecular Weight:**
  94,113 g/mol
- **Physical:**
  - Melting point: 40,9ºC
  - Boiling point: 181,9ºC
  - Density: 1,071 g/cm^3 [20ºC]
- **Molecular structure:**



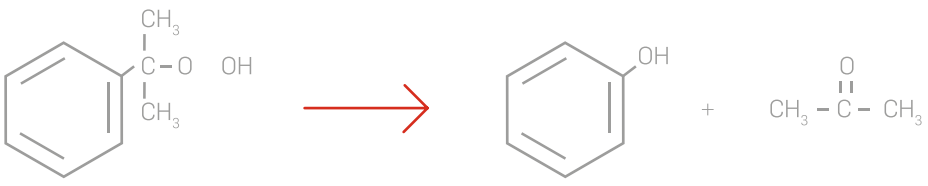
Manufacturing processes
Phenol can be produced via several processes. However, cumene peroxidation is the most common, since it currently offers the most cost-effective process economics. Cepsa employs this route in its plants in Spain and China.

Cumene peroxidation
Cumene is prepared by alkylating benzene with propylene using a zeolite-based catalyst

Cumene is then oxidized with air to cumene hydroperoxide.
After this step, cumene hydroperoxide, with a small amount of sulfuric acid, splits into phenol, acetone, alpha-methylstyrene and other by-products. Alpha-methylstyrene is typically hydrogenated to cumene and recycled, although some is recovered to sales.

BENZENE **PROPYLENE** **CUMENE**

CUMENE **CUMENE HYDROPEROXIDE**

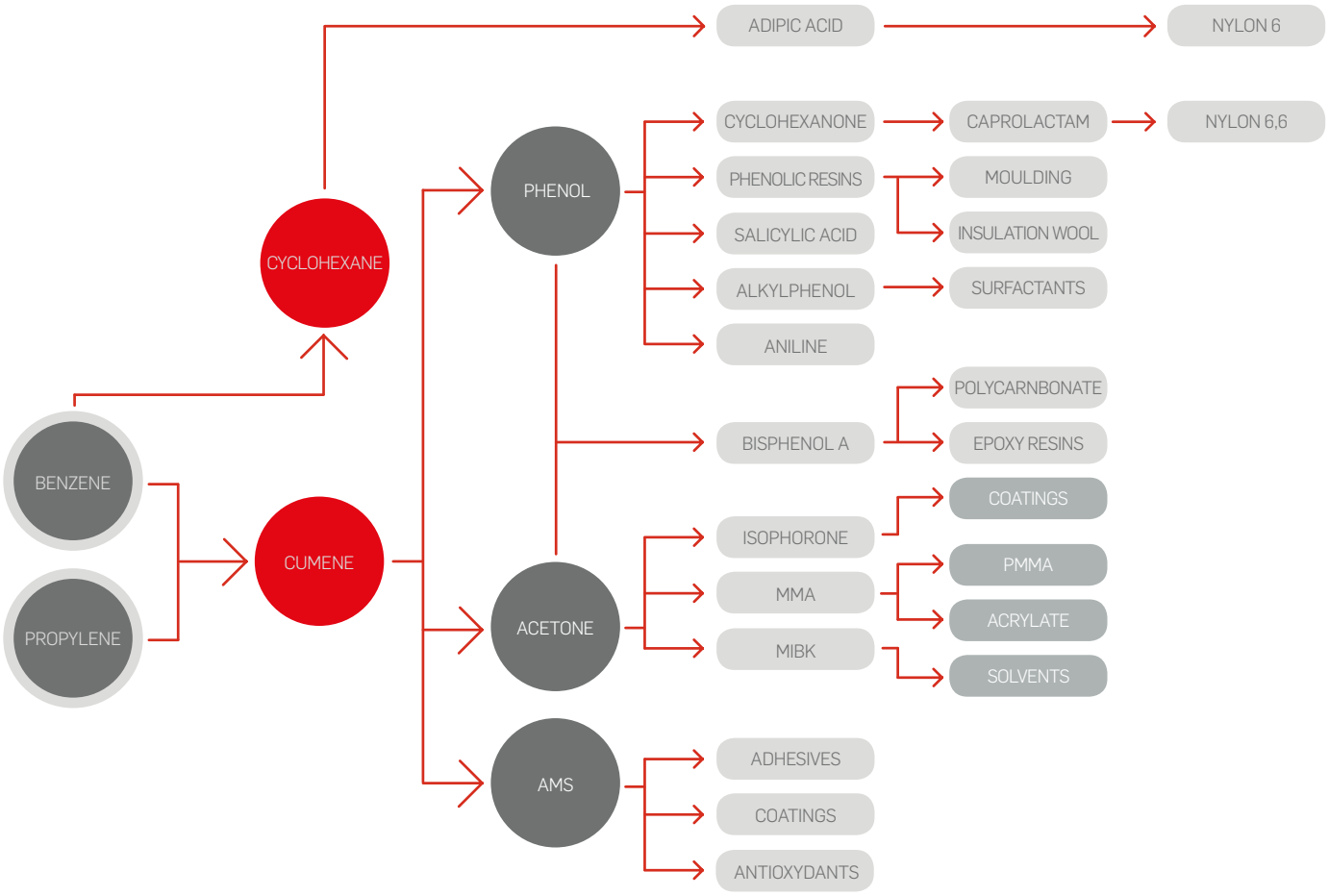


CUMENE HYDROPEROXIDE **PHENOL** **ACETONE**

3.3. Industrial Applications:

- Main use of phenol is the production of BPA (Bisphenol A) intermediate in the manufacture of Polycarbonate and Epoxy Resins.
- Phenol is employed to produce Cyclohexanone/Cyclohexanol for production of Caprolactam in Nylon 6,6 route.
- Also dedicated in the manufature of phenolic resins for a wide range of applications.
- As raw material for several industries: Pharmaceutical, food additives...

Phenol value chain is the illustrated in the following picture.



Industry Uses

- Abrasives
- Adhesives and sealant chemicals
- Flame retardants
- Fuels and fuel additives
- Intermediates
- Ion exchange agents
- Laboratory chemicals
- Odor agents
- Solvents (which become part of product formulation or mixture)

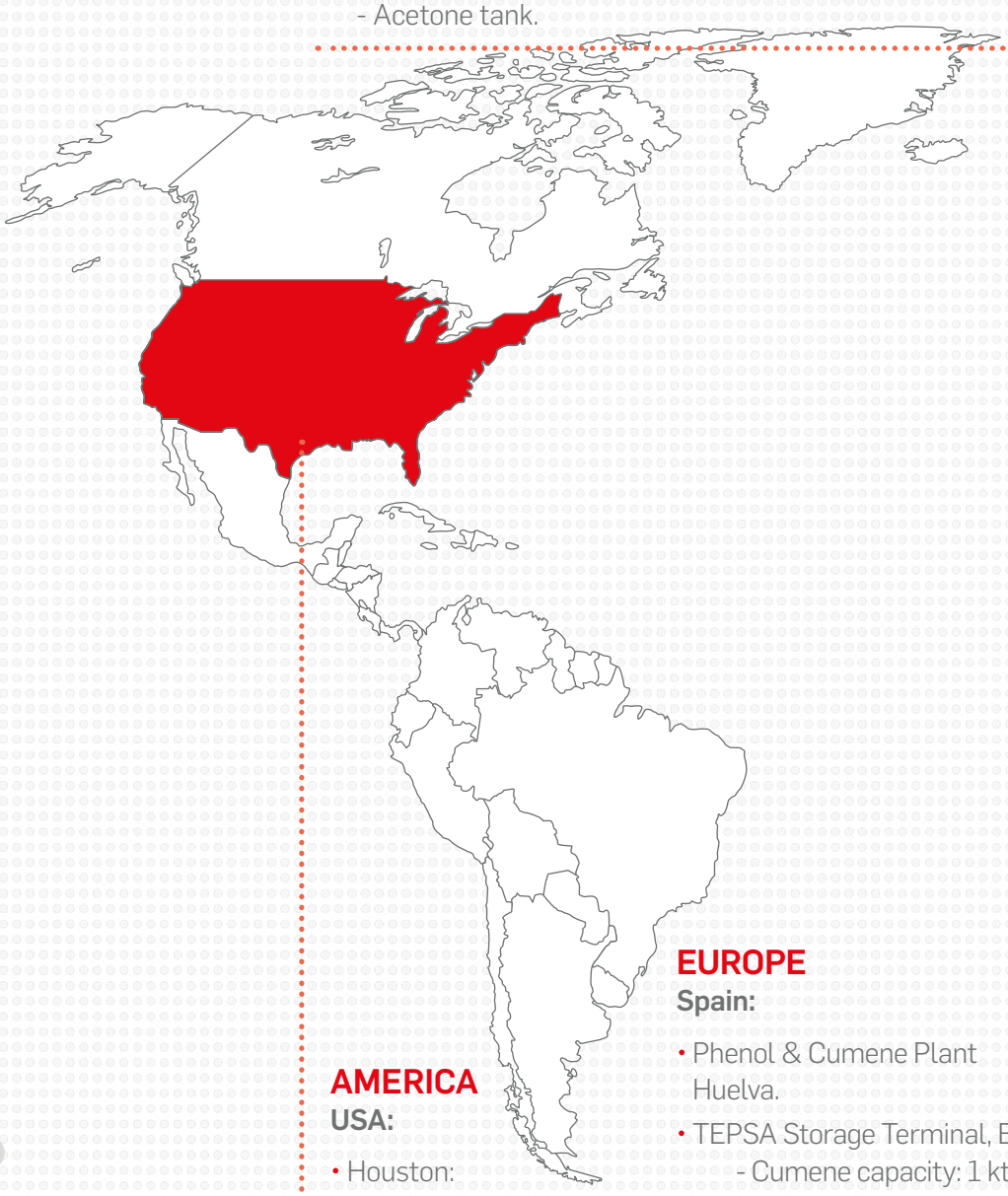
Consumer Uses

- Adhesives and Sealants
- Automotive Care Products
- Building/Construction Materials - Wood and Engineered Wood Products
- Cleaning and Furnishing Care Products
- House Flooring or Floor coatings
- Foam Seating and Bedding Products
- Fuels and Related Products
- Paints and Coatings
- Toys, Playground, and Sports equipment
- Food additives and flavouring agent.

3.4. Logistic facilities

EUROPE
United Kingdom:

- Sealsands:
  - Phenol tank.
- Riverside:
  - Acetone tank.



AMERICA
USA:

- Houston:
  - Acetone tank.

EUROPE
Spain:

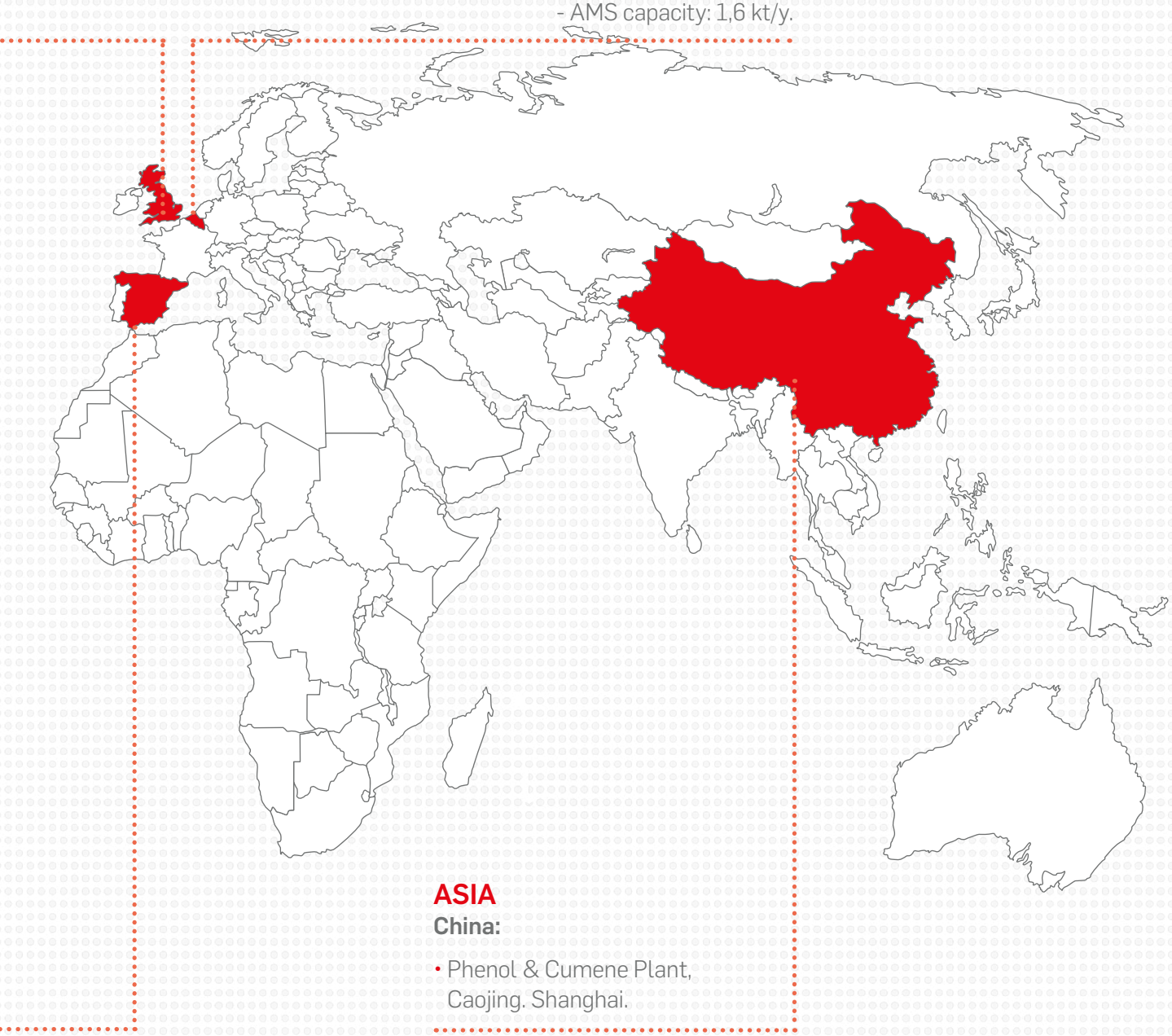
- Phenol & Cumene Plant Huelva.
- TEPSA Storage Terminal, Barcelona.
  - Cumene capacity: 1 kt/y.
  - Acetone capacity: 1 kt/y.

- All certificates of analysis available.

EUROPE

Belgium:

- LBC Storage Terminal, Antwerp.
  - Phenol capacity: 20 kt/y.
  - Acetone capacity: 9 kt/y.
  - Cyclohexane capacity: 6 kt/y.
  - AMS capacity: 1,6 kt/y.



ASIA

China:

- Phenol & Cumene Plant, Caojing. Shanghai.

ACHIEVEMENTS:

2017 award winner

MOST EFFICIENT STORAGE TERMINAL, LBC Antwerp.

3.5. Research Center:

A culture of R&D&i is one of our hallmarks. It is instrumental in creating new products, adding features to old products, optimise production processes to improve competitiveness or develop technology. In the end, R&D&i contributes to secure the sustainability of our business over time.

Research activities are centralized in a modern cutting-edge Cepsa research center located in Alcala de Henares (Madrid). The facility counts with pilot plants which virtually reproduce all production steps as well as sophisticated state-of-the art analytical equipment. However, the most important asset within the research center is the staff formed by highly specialized professionals who support the different business units (Upstream, Refining and Chemicals).

The R+D projects are often carried out through collaboration with different entities such as universities and technological centers.

3.6. Cepsa and the environment:

Preventing, minimizing and mitigating our impacts on the environment.

We are aware of the impact of our activities on our surroundings and we assume the implications involved for the development of our processes. We defend the compatibility between development and the environment. We are committed to sustainability and the optimization of our activities with the lowest possible impact.

The basic tools that we have to ensure the excellence in environmental performance are the following:

- Basic Environmental Regulations.
- Environmental Policy.
- Certified Environmental Management Systems in our major industrial facilities.
- An unified ISO 14001 certification for all production sites in Cepsa .
- Environmental Declarations at our refineries and chemical plants.
- Specific training in environmental matters.
- Specific strategies.

Focus on Phenol Business Unit, Chemical Palos Plant achieved a 100% of score in terms of sustainability in TFS audit. (February 2017).

3.7. Product portfolio:

Cepsa produces different grades of phenol and acetone, on the other side, we have one specification for cumene, acetone, AMS and cyclohexane.

Latest product specifications, material safety data sheets and Kosher & Halal declarations for acetone are available upon request.

- Cumene.
- Phenol.
- Phenol 90%.
- Acetone.
- Acetone Pharma Grade.
- Alpha-methylstyrene.
- Cyclohexane.

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