# LAB/LABSA
# BUSINESS UNIT


CEPSA

# LAB/LABSA BUSINESS UNIT

# INDEX

CHAPTER 1

# Cepsa

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

We are a global energy company, 100% owned by the Mubadala Investment Company, which is active in all stages of the oil and gas value chain: exploration and production, refining, transport and marketing of derivatives, bio-fuels, cogeneration and marketing of electricity, with close to 10,000 professionals and a presence on five continents.

We have developed an important chemicals division, which is closely integrated with the oil refining activities, 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 search of new goals and challenges, while maintaining our firm commitment to maximum customer satisfaction.

Thanks to our integrated business model, our technical excellence and ability to adapt, we have consolidated our position as a leading company, 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 experienced professionals 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 Chemicals is fundamental to the internationalization and growth of the Company.

Chemicals is one of the engines driving our internationalization and one of the areas where we are growing the most. All of that is thanks to the full integration with other areas such as refining.

At our chemical plants we transform crude into end products and raw materials for other industries with no end of applications: next generation plastics, cosmetics, shampoos, biodegradable detergents, paints, electronic components, pharmaceutical products and much more.

Our plants in Canada, Brazil and Spain have made us the world leading producer of alkylbenzene, the raw material used to make biodegradable detergents.

We are also the leading producer of cumene and the second in phenol and acetone, thanks to our plants in China and Spain.

We sell the solvents produced at our plants in Spain globally.

Thanks to our recent expansion in chemical plants in Indonesia and Germany, through our Sinar Mas Cepsa joint venture, we have diversified our raw material business with fatty alcohols from natural sources, a basic ingredient in the production of detergents and personal care products.

# Cepsa's global presence in chemicals

*(Plants capacities and ownership)*

**Palos de la Frontera** (Spain) **- 100% Cepsa**

**Cumene: 1,000 kt** **Phenol: 600 kt**
**Acetone: 370 kt** **AMS: 24 kt**

**Shanghai** (China) **- 75% Cepsa**

**Cumene: 360 kt** **Phenol: 250 kt**
**Acetone: 150 kt**

**Puente Mayorga** (Spain) **- 100% Cepsa**

**LAB: 220 kt** **LABSA: 80 kt** **N-Paraffins: 400 kt**

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

**Bécancour** (Canada) **- 100% Cepsa**

**LAB: 120 kt**

**Camaçari** (Brazil) **- 72% Cepsa**

**LAB: 260 kt** **LABSA: 120 kt**

**Dumai** (Indonesia) **- 50% Cepsa**

**Fatty alcohols: 160 kt**

**Genthin** (Germany) **- 50% Cepsa**

**Surfactants: 100 kt**

CHAPTER 2
## Chemicals at Cepsa

CHAPTER 3

# LAB/LABSA Business Unit

# 3.1. Industrial Sites

| | LAB (kt/y) | LAS (kt/y) | HAB (kt/y) | n-par (kt/y) |
|---|---|---|---|---|
| SPAIN | 220 | 80 | 6,8 | 400 |
| CANADA | 120 | | 3,6 | - |
| BRAZIL | 260 | 120 | 9,5 | - |

### Cepsa Química Puente Mayorga (Spain)

*One of the largest single LAB production sites, integrated with the adjacent Cepsa refinery.*

*UOP HF Technology based on hydrogen fluoride alkylation. Define unit to reduce the di-olefin content.*

*Falling Film Reactor (FFR) sulfonation units for the production of Linear Alkylbenzene Sulfonic Acid (LABSA).*

*Production of n-paraffin used as raw material in the three Cepsa LAB production sites.*

*Heavy alkylate (HAB), a paraffinic-aromatic oil based primarily on dialkylbenzenes, as a by-product in LAB manufacturing.*

*By 2020 plant Puente Mayorga will be the first LAB plant in the world to change from HF to Solid Bed Alkylation (SBA) technology.*

### Cepsa Química Bécancour (Canada)

*The world`s first LAB plant based on Detal technology.The state of the art process for making LAB,jointly developed by UOP and Cepsa.*

*The first LAB plant in the world capable of manufacturing not only high 2- phenyl but also low 2-phenyl LAB( HF - like product), due to the new generation of SBA catalysts ,loaded in 2017.*

*Heavy alkylate (HAB) produced as by-product in LAB manufacturing.*

### Deten Química (Brazil)

*The largest LAB plant in the world. It employs UOP technology, based on the hydrogen fluoride catalyst and uses a Define unit to reduce the di-olefin content.*

*Falling Film Reactor (FFR) sulfonation units for the production of Linear alkylbenzene sulfonic acid (LABSA).*

*Production of Heavy alkylate (HAB).*

# 3.2. Logistic facilities

Cepsa has developed a broad network of storage locations all over the world to fulfill the needs of our customers and ensure the delivery of our products on time.

## Storage facilities in:

**United Kingdom, Belgium, Spain, Mexico, Colombia, Chile, Brazil and South Africa.**

- Headquarters in Spain
- Commercial office in Belgium

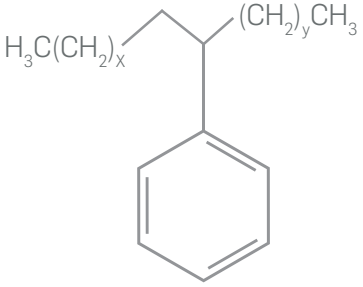
# 3.3. LAB at A Glance - Simplified Chemistry

- **Chemical name:**
  C10-C13 Linear alkylbenzene

- **Physical properties:**
  Melting point: < -70ºC
  Boiling point: 278 – 314ºC
  Density: 0.8603 g/cm$^3$ (15ºC)

- **Molecular weight:**
  240 g/mol (average)

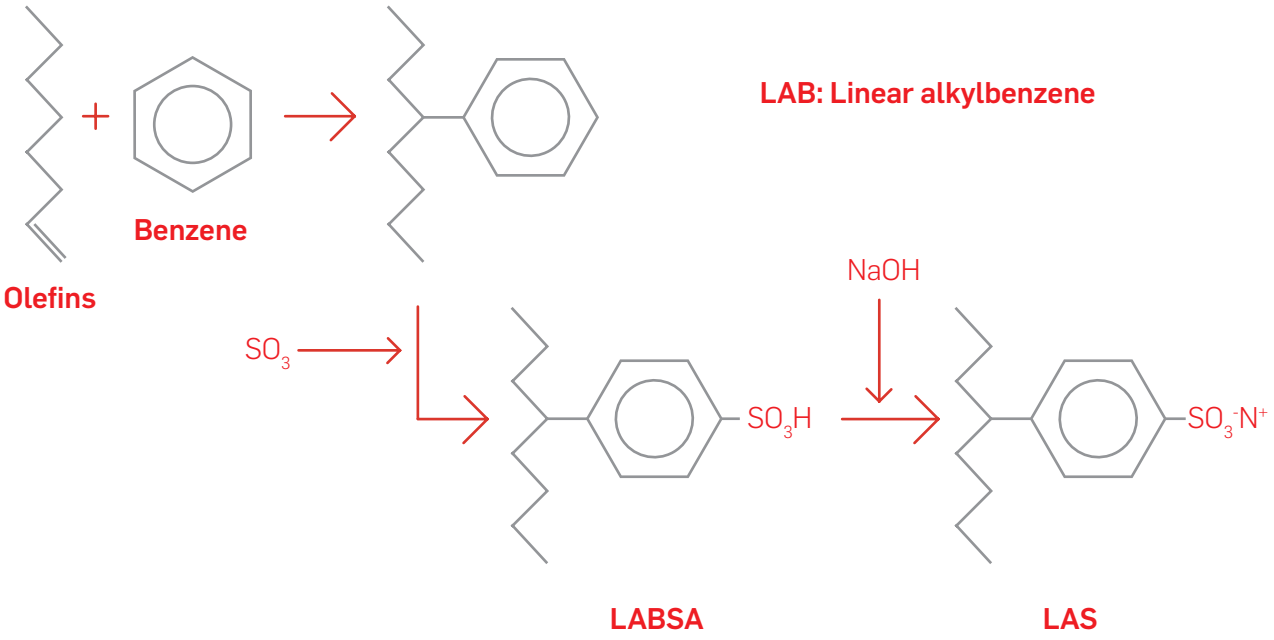
- **Molecular structure:**




# 3.4. Manufacturing process

Linear alkylbenzene (LAB) is the result of the catalytic alkylation of benzene, with linear mono-olefins obtained from n-paraffin dehydrogenation process, extracted from a hydrotreated kerosene cut.

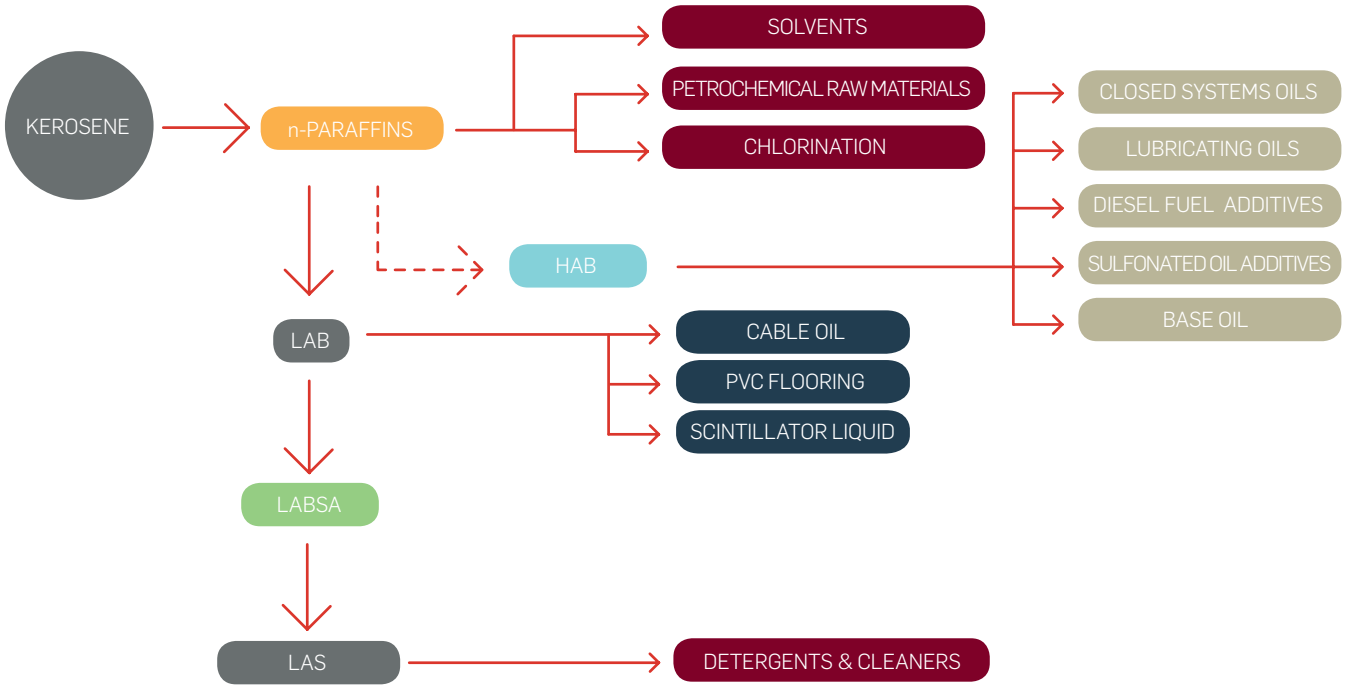
LABSA is produced by the sulphonation of LAB with sulfur trioxide ($SO_3$).



# 3.5. Industrial Applications

LAB is mainly used as a raw material to produce Linear Alkylbenzene Sulfonic Acid (LABSA) via sulfonation reaction and then Linear Alkylbenzene Sulfonate (LAS) via neutralization.

LAS is one of the major anionic surfactants used in the market for household detergents, such as laundry powders, laundry liquids, dishwashing products and all - purpose cleaners, as well as other minor applications in a wide range of different industries.




**LAB:** Linear alkylbenzene
**HAB:** Heavy Alkylate bottom
**LABSA:** Linear alkylbenzene Sulfonic Acid
**LAS:** Linear alkylbenzene Sulfonate

# 3.6. Research Center

**12.000 m², 9.000 m² for labs**

**50 Research Projects**

**Activities in:**

- Refining
- Chemicals
- Exploration and Production

Continuous improvement is one of our strongest values and is particularly apparent in our Research and Development area. We are driven to advance and innovate in all we do. We search for new business opportunities, improve our processes, and develop ever more advanced products.

Since 1975, we have worked with Cepsa's Research Center. Here we not only develop important research projects for our production centers and commercial units, but we also provide technical support to our customers.

We have laboratories, state-of-the-art machinery and pilot plants capable of reproducing the processes that we carry out at our production centers, mainly in refining and chemicals. This has enabled us to create more efficient and environmentally friendly processes, develop new products and promote added value projects.

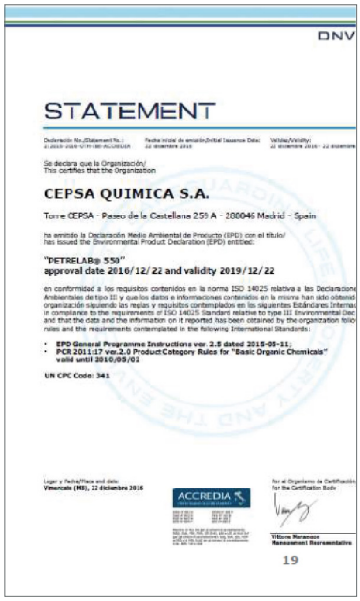
The Research and Development projects are often carried out through collaboration with different entities such as universities and technological centers.

Among the most noteworthy initiatives within the LAB/LABSA business unit should be highlighted the development and subsequent improvements of the most modern and efficient technology (Detal™) for making LAB. The launching of Detal represented a milestone in the detergent industry, allowing the substitution of HF by non-dangerous and easier to manipulate solid catalyst. The first commercial Detal-based plant came on stream in 1995 (Cepsa Chimie Bécancour, formerly known as Petresa Canada International). Since then, 85% of new added LAB capacity is based on Detal.

Our technical activities go beyond the process area and enter the application field. The surfactant and detergency laboratory of our research center undertakes a variety of projects: works for customers, quality improvement, evaluation of raw materials and new products, etc.

# 3.7. Cepsa and the environment

**Cepsa became the first and only LAB manufacturer to achieve the EDP (Environment Product Declaration).**


DNV

STATEMENT

CEPSA QUIMICA S.A.

"DETRELAB® 550"
approval date 2016/12/22 and validity 2019/12/22

ACCREDIA

19

## Preventing, minimizing and mitigating our impact 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 at our major industrial facilities.
- A unified ISO 14001 certification for all Cepsa production sites.
- Environmental Declarations at our refineries and chemical plants.
- Specific training in environmental matters.
- Specific strategies.

Cepsa has historically contributed to study the result and effects of LAS on the environment, and has published some key studies and international publications.

Cepsa is a member of groups such as the LAB/LAS Consortium ECOSOL (European Council on Studies on LAB/LAS), CLER (Council of LAB Research. USA), CESIO (Comité Européen des Agents de Surface et leurs Intermediaries Organisques), AEPSAT (Asociación Española de Productores de Sustancias para Aplicaciones Tensioactivas), as well as other groups and consortia related to regulatory affairs.

# 3.8. Product portfolio

Cepsa produces several grades of Linear Alkylbenzene (LAB), the corresponding sulfonic acid derivative (LABSA) and also Heavy alkylate (HAB). The list of commercial products is showed in the following table:

| Product | Commercial name | % 2 phenyl | LAB type | Site |
|---|---|---|---|---|
| LAB | PETRELAB® 550 | low | C12 | Spain |
| | DetLAB® 240 | low | C12 | Brazil |
| | PETRELAB® 550-QL | low | C12 | Canada |
| | PETRELAB® 500-QL | low | C11 | Canada |
| | PETRELAB® 500-Q | high | C11 | Canada |
| | PETRELAB® 550-Q | high | C12 | Canada |

| Product | Commercial name | % 2 phenyl | LAB type | Site |
|---|---|---|---|---|
| LABSA | DetLAS® 320 | low | C12 | Brazil |
| | PETRESUL® 550 | low | C12 | Spain |
| | PETRESUL® 550-Q | high | C12 | Spain |
| | PETRESUL® 500-Q | high | C11 | Spain |

| Product | Commercial name | Average MW | Site |
|---|---|---|---|
| HAB | PETRENE® 900 | 335 | Spain |
| | DetALP® 360 | 340-350 | Brazil |
| | PETRENE® 900-Q | 380-390 | Canada |

Latest product specifications, MSDS and standard declarations available upon request.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