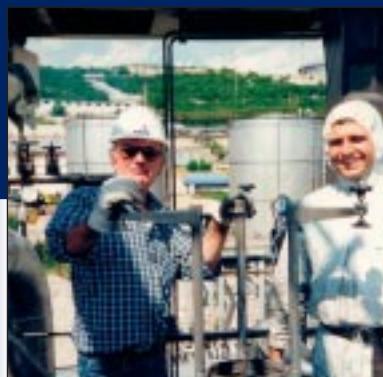
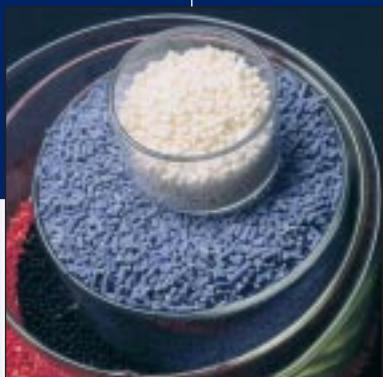


Technologies

for the Refining, Petrochemicals & Gas Industries

Products & Services







Jean Sentenac
President & Chief Executive Officer



Jean-Pierre Franck
Chief Operating Officer

Axens is an established name in the hydrocarbon industry. Our objective is to be your technology benchmark company for applications in the refining, petrochemical and gas processing sectors. This brochure is furnished to give you a better idea of the overall Axens offer as a technology, catalyst & adsorbent and service provider. We hope that you will find this information of interest and will visit our Internet site, at www.axens.net, or contact our business units for additional information.

Although our name is new, we are a company backed by nearly fifty years of commercial success. The combination of the technology and services group with the catalyst & adsorbents manufacturing and supply business has created an efficient organization that handles your needs as a single source.

Improving your performance and helping you to be more successful is our only business. We are a non-aligned, pure technology company. We do not sell motor fuels or chemicals; we do not operate service stations. There is only one thing that we do – provide technology and the products and services that are needed to make your hydrocarbon processes operate at their top performance. And our goal is to do this better than anyone else in the world.

Axens is built on an image of reference technology – quality products that are commercially proven, dependable, reliable and cost effective. We hope that this image is transmitted through our corporate identity, through our technical and commercial personnel and through our trademarks. Welcome to Axens, the home of: ACE Technology, Alkyfining, Alphabutol, Arofining, Benfree, CRS Claus catalysts, Dimersol, Equiflow, H-Oil, HR series catalysts, Hyvahl, LD series catalysts, Liquefin, Manufacturing Quick Wins, Multibed, Octanizing, Oparis, Paramax, Prime-G+, Prime-D Toolbox, and many, many more.

A handwritten signature in black ink, appearing to read "Sentenac".

Jean Sentenac

A handwritten signature in black ink, appearing to read "Franck".

Jean-Pierre Franck

Built on Rock-Solid Foundations



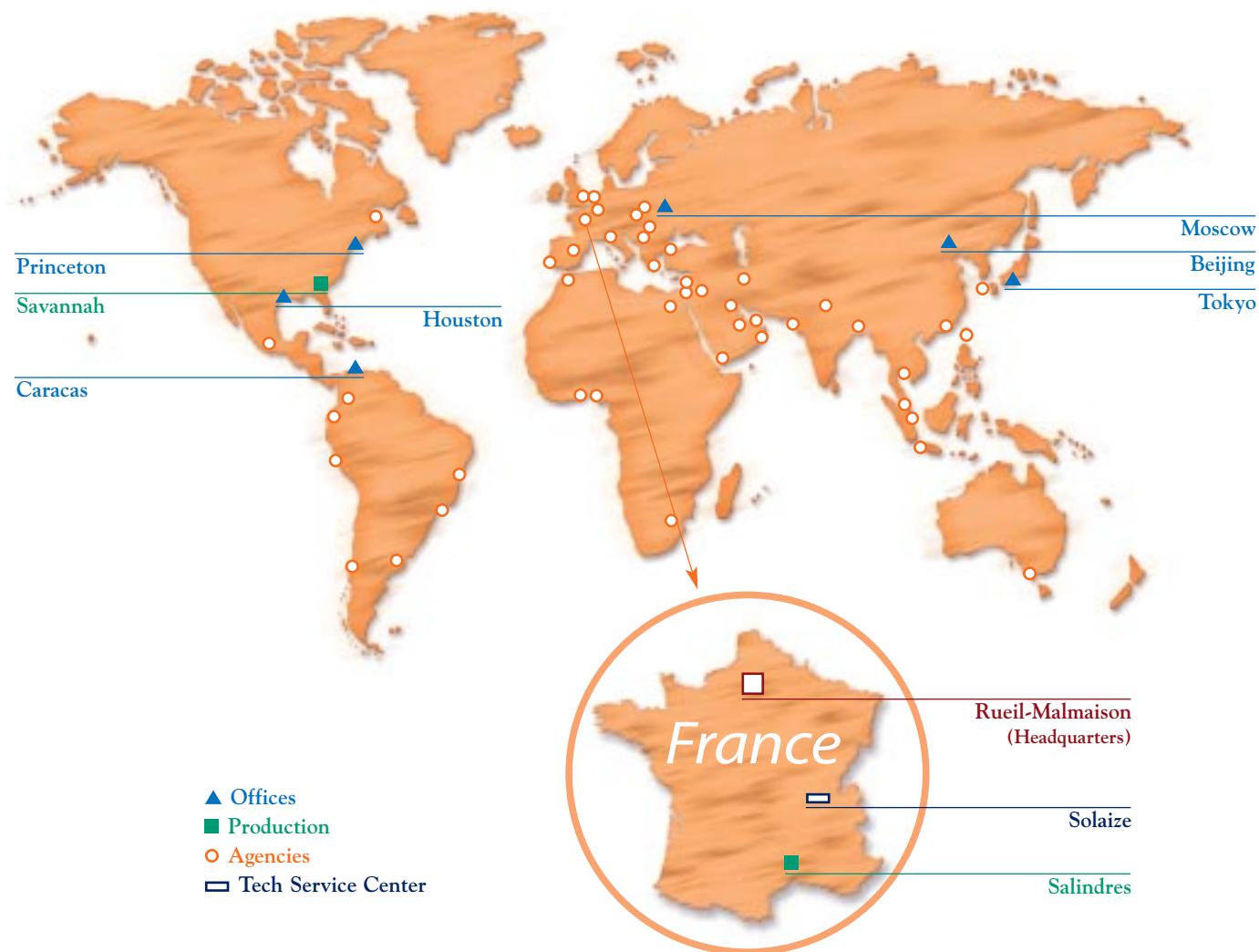
A Historical Perspective

Axens was created by IFP (Institut Français du Pétrole) on June 30, 2001 through the merger of the Procatalyse Catalysts and Adsorbents company with IFP's Industrial Division specialized in technology licensing and services. This provides us with a single source offering of technology, products and services and enables us to more efficiently and rapidly respond to customer needs.

Procatalyse was created in 1959 by IFP, to leverage IFP's knowledge in catalysts

for the refining and petrochemical industry and to have the products required for its process technology.

IFP's Industrial Division traces its origins to its first technology license in 1955. Almost immediately after its creation, in 1944, IFP began assembling a first class graduate school for engineering in the fields of petroleum and motor sciences and an active program to develop improved methods and technologies for refining crude oil to motor fuels and petrochemicals.



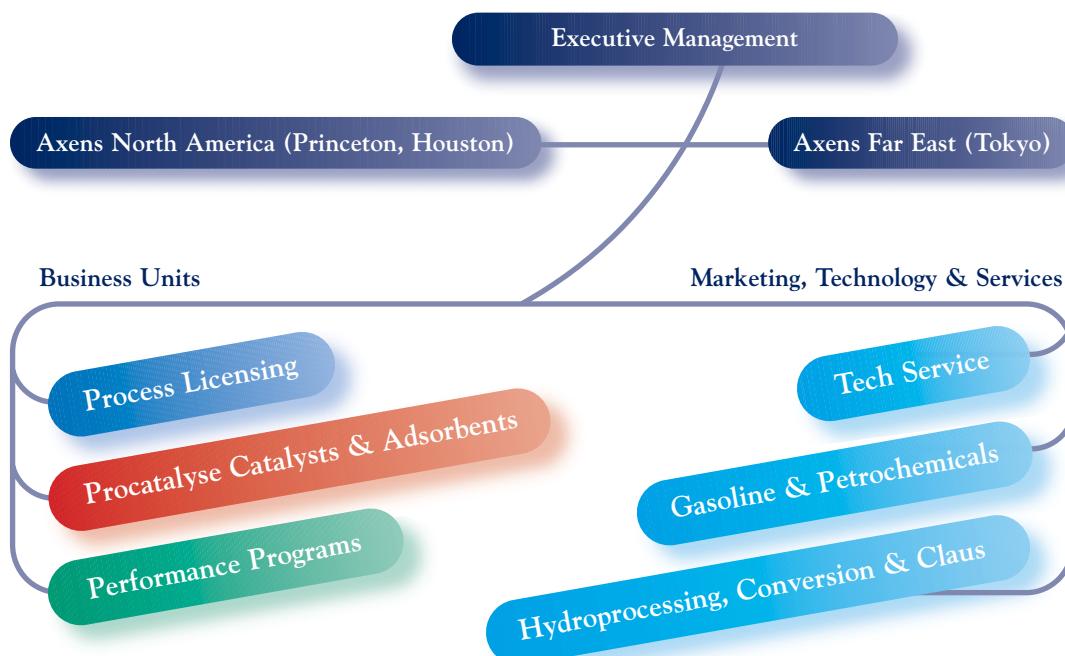
and Foundation



In 1995, the Princeton, NJ, USA based Hydrocarbon Research Institute (HRI) was acquired. Created in 1943 with a long history of heavy oil and coal upgrading technologies, the HRI heritage is now an important part of Axens North America.

Service and two marketing and technology groups: Gasoline & Petrochemicals; Hydro-processing, Conversion & Claus.

[Operational Organization]



Axens North America and Axens Far East are wholly owned companies serving the North American and Far East markets respectively. Our operational organization has three business units covering: technology licensing, catalyst & adsorbent manufacturing and supply and operational improvement programs. Three technical departments serve the business units, Tech

[Our Mission]

Axens' mission is to continually improve our customers' performance. We will grow by a combination of internal growth and targeted alliances and acquisitions with the continuous objective of providing our customers with the best overall technologies, products and services available worldwide.

Worldwide Network

www.axens.net



*Contact us on the web or anytime, anywhere.
We operate a worldwide network.*

Our Customers Span the Globe

*Our products and services are present in virtually
every country having hydrocarbon processing industries.*



Markets Served

Axens is one of the world's foremost suppliers of technologies, products and services to the refining, petrochemical intermediates and gas processing markets.

Our strong position in petroleum refining covers virtually every area from naphtha hydrotreating through vacuum residue conversion and offers commercially proven solutions for clean fuels production.

We are a world class provider in the petrochemical sector, with leading positions in

the purification of monomer-intermediates and specialty olefins and in the production and purification of aromatic intermediates: benzene, toluene and paraxylene.

In gas processing, Axens is a long-standing leader as a performance catalyst supplier in sulfur removal by the Claus process. The company is also entering the natural gas liquefaction field (*Liquefin* process) and positioning itself in GTL technology, based on Fischer-Tropsch synthesis.

Technology Licensing

Axens is a premier technology provider. We deliver to our customers: optimization and feasibility studies; basic engineering packages for small revamps through to major grassroots complexes; hazop studies; detailed engineering reviews; and much, much more.



The Motor Fuels The Motor Fuels Expert



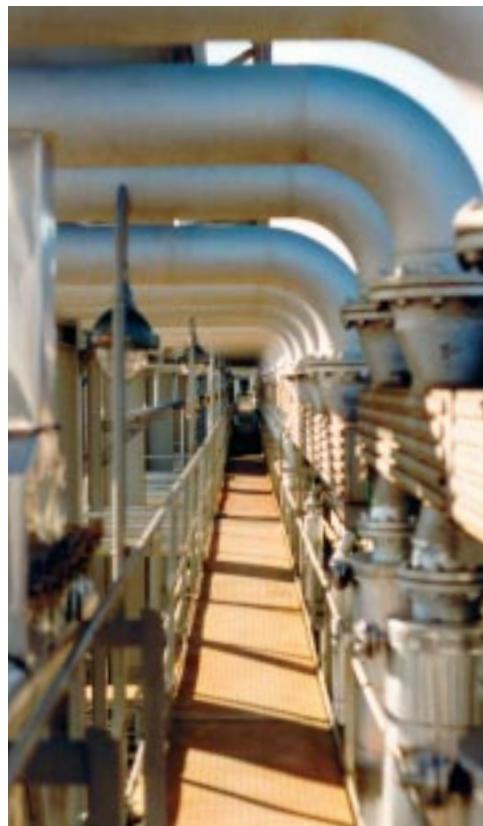
Gasoline & Diesel Fuel Solutions

Axens' advantages: our human resources, our commitment to continuous development and the search for improvement, and our large array of technologies, products and services. One of our strongest core businesses is in motor fuels production, purification and optimization.



Gasoline

Gasoline production and specification attainment are areas in which we are market pace setters. Our Octanizing (CCR Reforming) and R2R (FCC) technologies are cornerstones for gasoline production. Our Prime-G+ (naphtha desulfurization), Benfree (benzene reduction), Ipsorb (recycle isomerization), C₅/C₆ isomerization and ethers technologies are key process blocks for ensuring gasoline specification attainment. Classed by the number of awarded licenses, all of these technologies are either worldwide market leaders or second in their categories.





[*Diesel*

We have been in diesel hydrotreating longer than in any other refining technology. Our *Prime-D Toolbox* is a market frontrunner in ensuring high quality, ultra low sulfur diesel (ULSD). We provide high activity and high stability *HR* series catalysts and the most advanced reactor internals in the industry – *EquiFlow*. When it comes to diesel production, we have technologies that are either dedicated to producing ULSD or to producing diesel in combination with feeds for other units, for example: *H-Oil*, *Hyvahl*, *MHDC* (mild hydrocracking), *HyTail* (intermediate fraction hydrocracking) and *HDC-HP* (high severity hydrocracking).

[*Manufacturing Quick Wins*

Our Performance Programs team provides studies to optimize production goals through many different services, such as: hydrogen hunting – to find unexploited refinery hydrogen; carbon dioxide auditing – to reduce fuel and electrical consumption; crude assay studies – to optimize refinery margins; and advanced process control and complete refinery optimization studies.

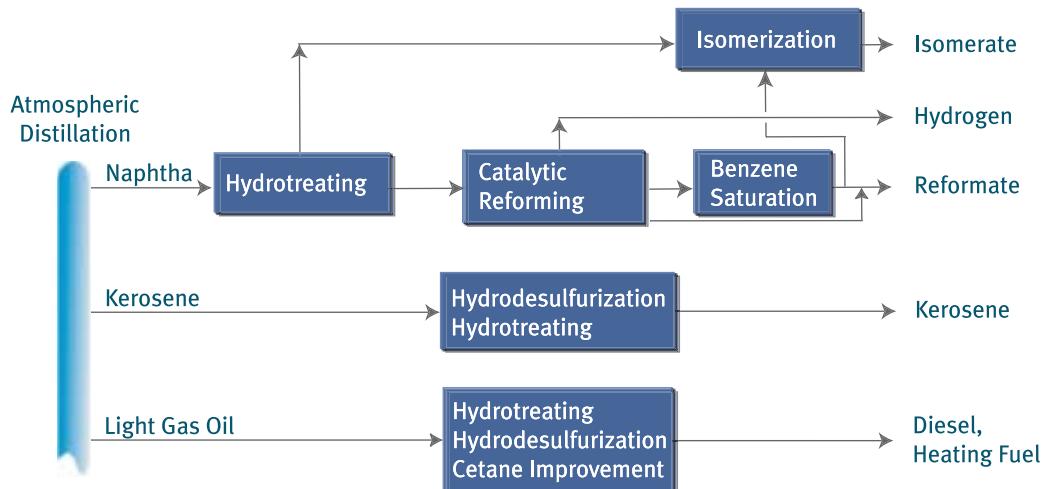
Refining

Refining



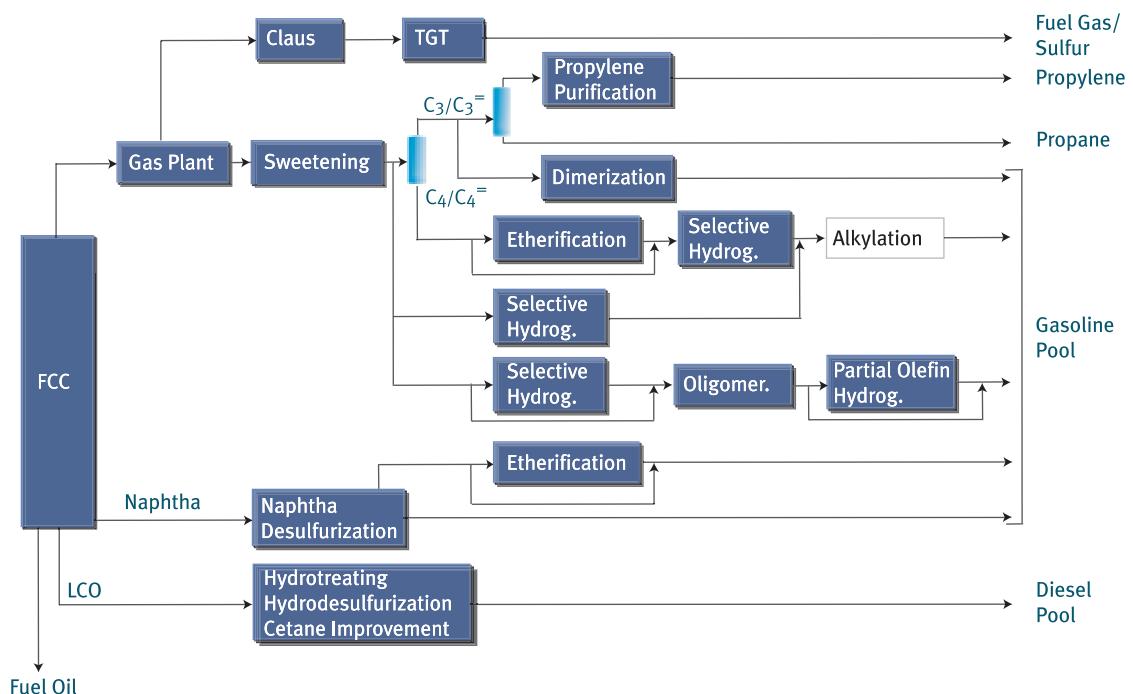
Providing technological solutions for all production goals

Naphtha & Middle Distillates



Benfree, CCR Octanizing, Dualforming, Ipsorb, Hexorb, Prime-D Toolbox

FCC Complex

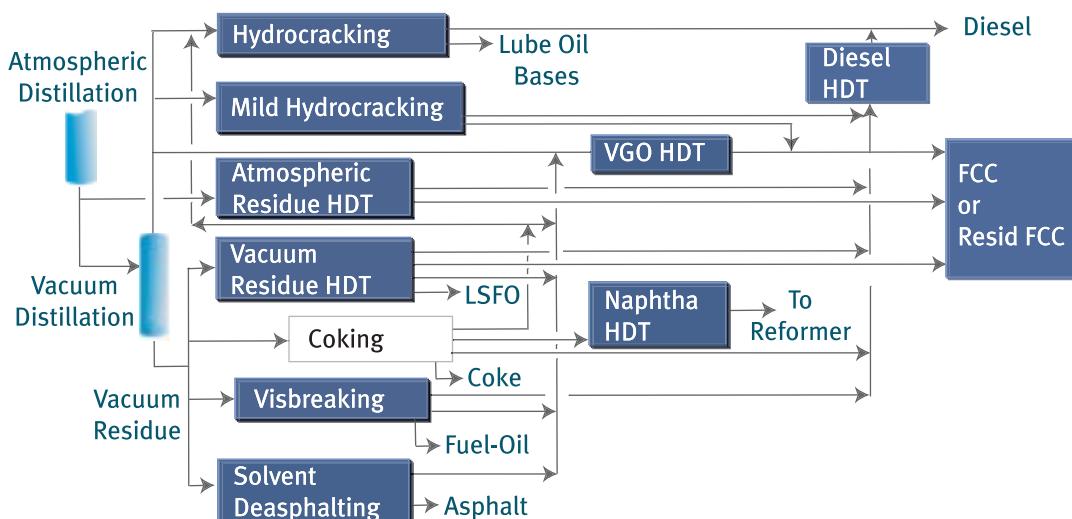


Alkyfining, Catacol, Dimersol-G, Prime-D Toolbox, Prime-G+, Polynaphtha, Selectopol, R2R



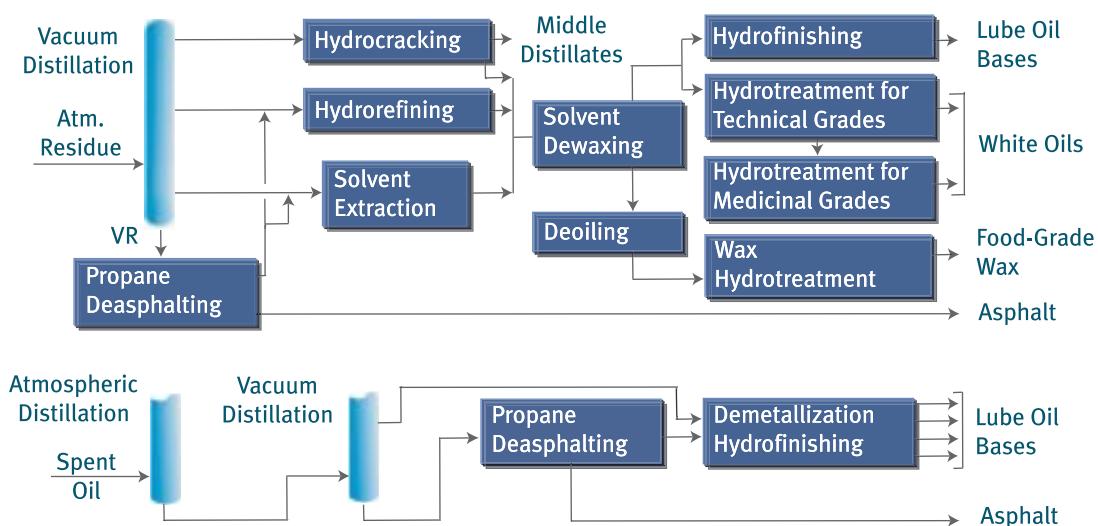


Residues & Heavy Fractions



HDC-HP, H-Oil, HyTail, Hyvahl, MHDC, R2R, Solvahl, T-Star

Lube Oils, White Oils, Paraffins



HDC-HP, Revivoil, Selectopropane



Petrochemicals

Petrochemicals

A Pacesetter in Olefins & Aromatics Purification

Selective hydrogenation, aromatics production & purification, and homogeneous catalysis are synonymous with Axens.

Our satisfied customers have made us a leading provider of petrochemical intermediate production and purification solutions.

Olefin Processing

Steam crackers are the heart of the world's olefins production. Olefin building blocks are required in ultra high purity to respond to the quality requirements for polymerization reactions. Axens has the largest portfolio of olefin processing technologies and catalysts in the world and a cumulated operating experience that exceeds 30 centuries.

Our LD series catalysts are the clear market choice for all liquid phase hydrogenation reactions including the purification of C₃,

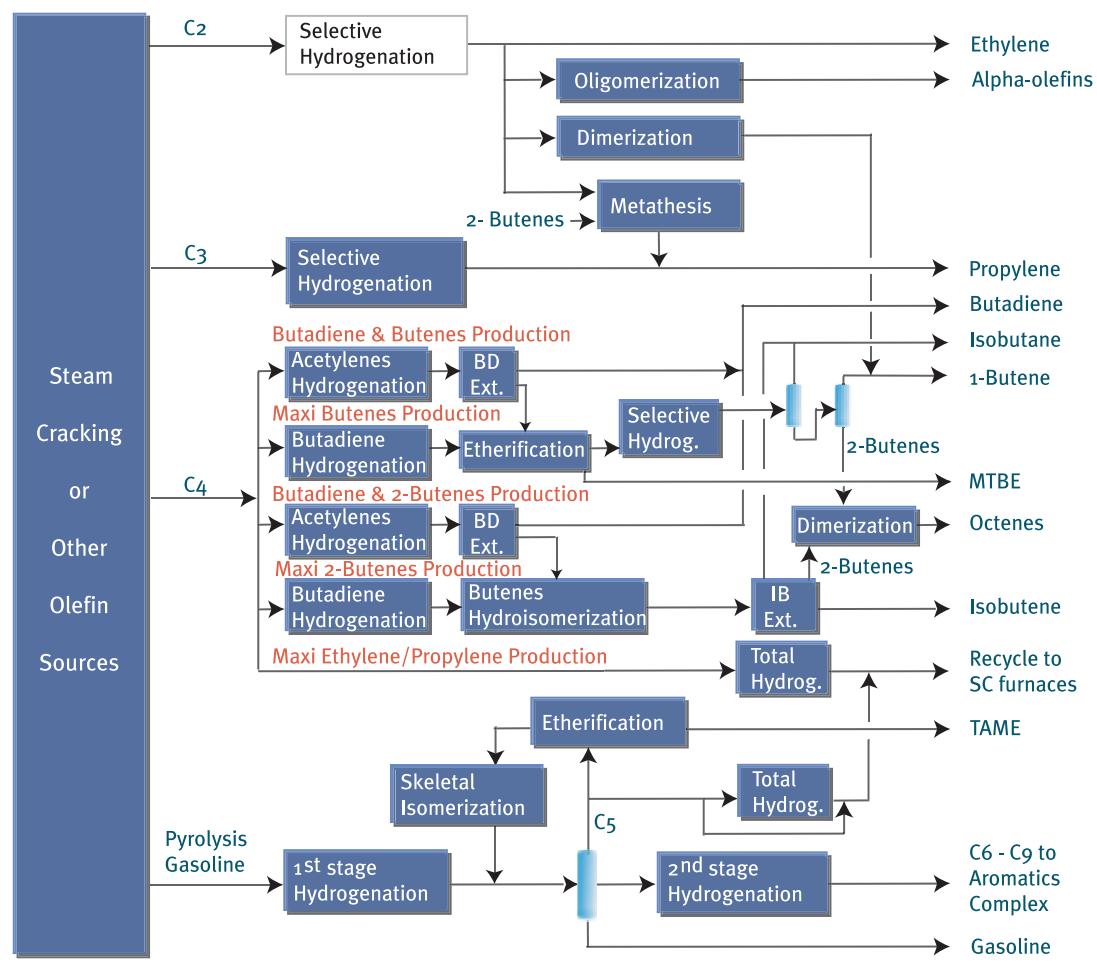


C₄, C₅ and pygas cuts. Olefin transformation reactions are Axens best sellers, including: *Alphabutol*, for the production of high purity butene-1 from ethylene; *Dimersol*, for the production of hexenes and octenes from propylene and butenes.





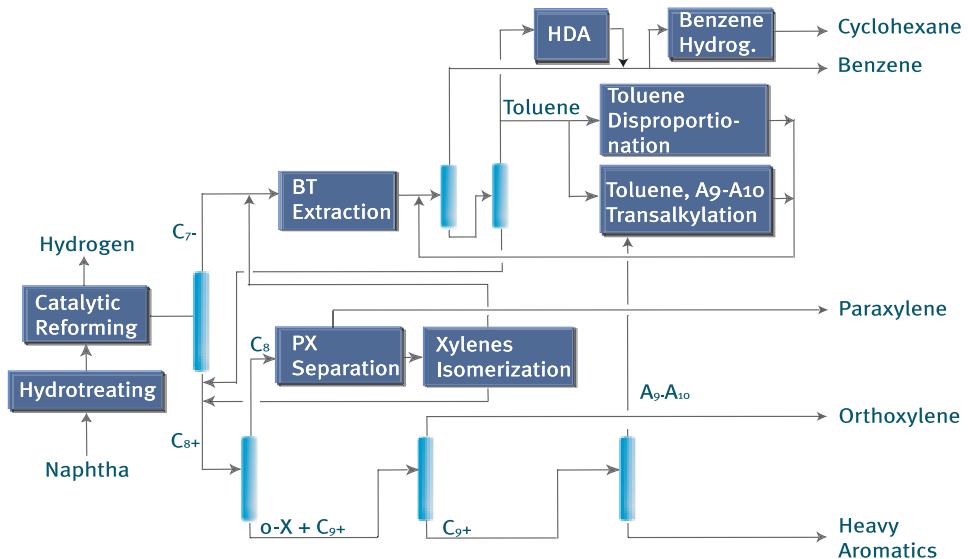
Olefins - C₂ to C₅₊



Alphabutol, AlphaSelect, Dimersol-X, GHU-1, GHU-2, Iso-5, Isopure, Meta-4



Aromatics - The ParamaX Suite



Arofining, CCR Aromizing, Eluxyl, Oparis

Paraxylene Purification

Benzene, toluene and paraxylene (BTX) are produced by naphtha steam cracking and by employing CCR reforming technology (Octanizing and Aromizing). The xylenes fraction is composed of ethylbenzene and three isomers – ortho, meta and paraxylene. The paraxylene (PX) is used as a building block in polyethylene terephthalate (PET), employed in plastic bottles and in a vast array of fibers. The PX is required in high purity to provide the cleanest, brightest final products.

Axens has distinguished itself as a leader in PX production and purification technologies with its well known *ParamaX Suite* of Aromatics Technologies. Our *Eluxyl* process is at the heart of the ParamaX Suite and is known for its excellence in operation, high capacity trains, multi-valve system and high stability molecular sieve adsorbent.

Cyclohexane Production

Axens is also the world leader in high purity cyclohexane production through benzene hydrogenation with our *HC series* catalysts.





We provide processes that address this rapidly expanding market.

RAM

Downstream processing and environmental needs require removing arsenic and mercury compounds from natural gas and condensate streams to the parts-per-billion level. Axens' processes recover these contaminants for proper disposal rather than release them to the local environment.

is no longer limited by a single cryogenic heat exchanger. Efficient, low cost, multiple plate-fin exchangers are employed. Heat exchange duty, traditionally assured by two very different refrigeration systems, is balanced so that identical drivers can be used for the main compressors. Operation is simplified and the costs for spares and maintenance are considerably reduced.

Liquefin

This new, highly competitive natural gas liquefaction process has many advantages affording a capital cost that is substantially lower than conventional schemes. Its modular construction means that train size

Gasel

The development of technology for Fischer-Tropsch conversion of natural gas to paraffin liquids is well underway and due to be commercially available in several months. The process is particularly attractive for "stranded" sources of natural or associated gas. Diesel cuts produced from this process have zero sulfur and cetane numbers near 75, making them ideal for diesel blending.



Multibed

Multibed processing removes contaminants such as liquid or gaseous water, CO₂, H₂S and chlorides from gas or condensate streams using combinations of specialty alumina and molecular sieve adsorbents. The ability of these patented systems to withstand liquid slugs and higher-than-normal concentrations of water, makes this process a hit with gas processors.

Catalysts, Adsorbents, Products



We are committed to the development, manufacture and service of catalysts & adsorbents for the refining, petrochemical and gas markets.

Two manufacturing locations, Salindres, France, and Savannah, Georgia, USA, produce catalysts and alumina gel. A substantial portion of our revenue is reinvested into catalyst discovery and improvement so we can offer the best catalysts available today and in the future.



We provide a complete service program that includes start-up assistance, performance follow-up, analysis of spent material, regeneration recommendations and performance prediction. We furnish our customers with all the technical services needed during the entire life of our products. The services covered during the products' final phase include:

- End-of-cycle catalyst analyses
for regeneration decision
- Technical expert evaluation
and recommendations on re-use
- Unloading supervision
- Product disposal assistance



nts, Products

Catapac

Catapac is an ultra high density loading technique which is used to add more catalyst to the same reactor volume: up to 25% additional catalyst. With Catapac, you get more from your initial investment by using your reactor volume to its maximum potential.

Reactor Internals

Our unique line of *EquiFlow* reactor internals makes better use of our excellent catalysts. *EquiFlow* optimizes flow distribution at the entrance of each catalyst bed and also homogenizes mixed fluids inside reactors, thereby ensuring the longest cycle lengths of operation. This reduces the number of change outs, improves on-stream factor and reduces overall catalyst costs.



Texicap offers substantially higher performance from fixed bed radial reactors, where low pressure drop is critical, such as in reforming units. Application of *Texicap* reactor internals can provide a combined addition of up to 15% additional throughput, higher activity or longer cycle length to your operations.

Toll manufacturing

If you have a particular catalyst or adsorbent need that is not directly available from our catalogue, contact us and we will discuss with you the possibility of making a special product for your needs.



Hydrotreating



With the programmed improvement in fuel product specifications and increased demand for middle distillates, hydrotreating catalyst technology has become crucial to the refining industry. Axens offers a complete product range of hydrotreating and hydroconversion catalysts for naphtha and gas oil to residue applications. Axens' investments in catalyst discovery & development and in our state-

of-the-art manufacturing facilities, brings you the best catalysts through the ACT, HR, HT, HTH, HTS, HYC, HMC and HOC series. This line of products is strongly supported by commercial experience and a complete offer of services and proprietary reactor internals technology: *EquiFlow*. For more information, ask about our ACE Technology, dual-activity hydrotreating catalysts.

Hydrogenation



Hydrogenation is a key purification process for both the refining and petrochemical industries. Its growing importance is driven by the need to optimize plant operations in order to comply with increasing stringent specifications. Our broad experience and our catalyst technology bring you the best in performance, reliability and technical support. In addition to workhorse catalysts such as the LD series, we offer a wide range of products that can be adapted to virtually any hydrogenation scenario.



Reforming & Isomerization



Axens is a leader in naphtha reforming. We have been very active in this market



for over four decades, providing a complete range of reforming catalysts for semi-regenerative, cyclic and continuous regeneration processes suitable for all unit designs. Our portfolio also includes aromatics production and isomerization catalysts. Our AR, CR, RG, ATIS, IS series products come with a complete range of expertise and services and proprietary techniques such as *Texicap* and *Catapac*.

Sulfur Recovery

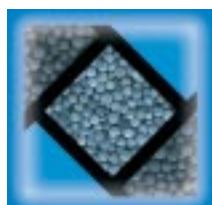


Environmental regulations concerning fuels and industrial wastes present a serious challenge to refiners who must treat increasing amounts of acid gases while simultaneously improving sulfur recovery. For years, we have brought to the market-place attractive solutions for sulfur recovery as well as a complete portfolio of solutions for sulfur reductions in fuels. Our AM, CR, CRS, TG and TGS series products fit your needs.

Axens is the world's leading supplier for top-of-the-line Claus sulfur recovery catalysts.



Guard Beds



As a pioneer in the field of noble metal catalyst utilization and protection of these catalysts from premature deactivation, Axens offers a full range of guard bed materials to trap catalyst contaminants and

poisons such as sulfur, arsenic and mercury, and for particle contaminants such as polymeric materials, rust, sand and sludge. Ask us about our ACG, CMG and MEP series products.

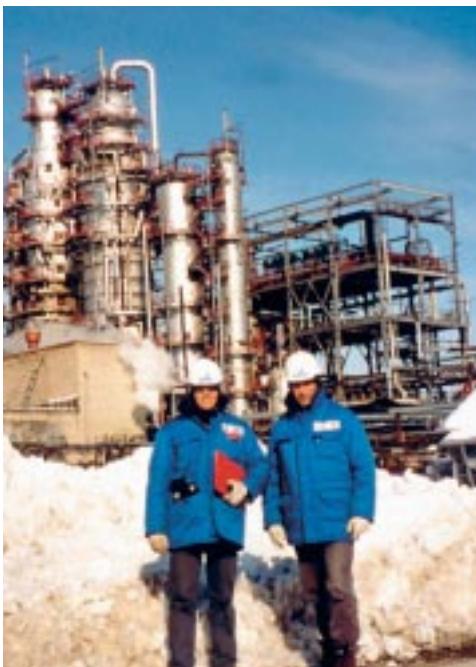
Adsorbents



Adsorption is a well-known technique that is employed to purify many different gas and liquid streams. Axens, with its unique range of specialty aluminas and molecular sieves, squeezes the best performance from your units. With decades of experience in adsorption technology, we not only supply products (AA, SAS and MS series) but also a global expertise and services. Our commercially-proven *Multibed* technology provides an optimized combination of our adsorbents for improved operations.

In serving you better we fulfill our mission

Customer Service is our business



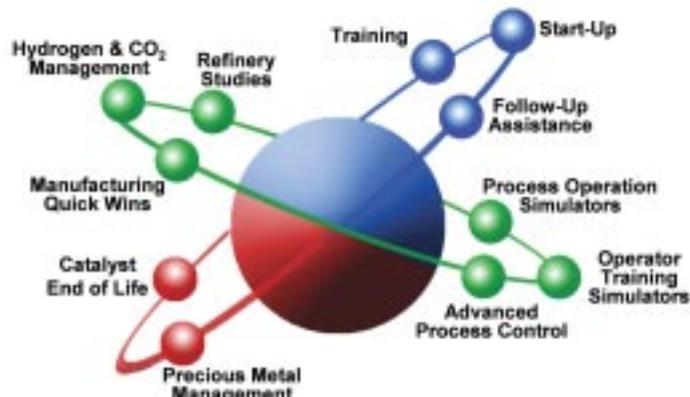
Training

Axens has a wide selection of training programs – from on-site and classroom type operator training for Axens' units to training programs for operators and foremen through IFP's Continuing Education Center. Additionally, the IFP School offers a master's degree program for Chemical Engineering. Axens also provides specific and generic operator training simulators for most process applications.



Start-up Assistance

As part of a process licensing or catalyst purchase agreement, Axens provides start-up assistance, inspection, pre-commissioning, commissioning, catalyst loading and all start-up and operational know-how to ensure that your unit performs to expectations.



Follow-up Assistance

Monitoring and assistance continues once your unit is up and running. We offer optimization studies, evaluation and enhancement, performance monitoring, consulting, analyses, troubleshooting, regeneration consulting, catalyst and adsorbent loading, catalyst recovery to ensure optimal performance of your units, refineries, gas plants and petrochemical complexes.

e fulfill our mission



Advanced Services

Axens is well-equipped with advanced services to further improve customer profitability. We bring together the power and resources backed by five decades of discovery, development, reaction kinetics, modeling, process know-how and design, control and optimization, commercial start-ups & operations, with safety and environmental considerations ever present. The advanced services offered through the Performance Programs Business Unit are organized along three lines:

[Process Simulation]

Operator Training Simulators and Process Operations Simulators, based on customized reactor kinetic models, provide accurate simulations that are well fitted to your units.

[Refining Expertise Services]

These services cover refinery studies as well as hydrogen and CO₂ management. The main objectives are to package a large range of expertise to supply optimized refinery operations taking into consideration market constraints and site issues.

[Profit Optimization]

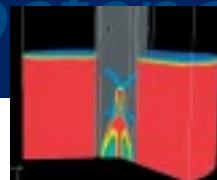
Manufacturing Quick Wins – Axens' extensive operations know-how and technology background are applied to develop plans for production enhancement. This results in rapid implementation solutions to generate a fast return.



Advanced Process Control – Process expertise supported by proprietary inferential models provides the definition of the best Advanced Process Control (APC) strategies. Associated with a powerful multi-variable predictive controller, these strategies provide cost effective APC implementations. Economic optimization is considerably improved by use of rigorous kinetic models.

Integrating Core Competencies

Integrating Core Competencies



Strong R&E Support

The unending demand for lower investment costs, lower operating costs, lower emissions, higher yields, easier operations, shorter down times, has led to many improvements which require multiple steps of verification before commercial implementation. Pilot plant verification is a key to commercial success. Axens' research and engineering (R&E) programs focus on developing and approving new processes and products and improving existing ones to better meet your needs.



Research & development activities are principally carried out at two sites in France: Salindres (near Marseille) and at the IFP Development Center in Solaize (see photo below).

Scale-up of catalysts and adsorbents from laboratory to commercial production is performed in pilot plant facilities at the catalyst and adsorbent manufacturing site in Salindres.

Pilot plant test facilities for testing new catalysts and developing new processes and process know-how are principally located at IFP in Solaize.

Engineering and Design for new process designs and improvements and for grassroots and revamping projects are carried out in the Rueil-Malmaison, France and Princeton, New Jersey offices.

IFP Development Center



The advertisement features a whiteboard-style background with handwritten text and diagrams. The text asks, "What formula produces the best vehicle for high purity Phenol-Xylene production?" It lists four options: 1. Axens™, 2. Axens™, 3. Axens™, and 4. Axens™. Below the list is a diagram showing a flow from "Axens™" to "Paramax™" to "Axens™". The bottom half of the ad contains the Paramax logo, the text "The BTX Aromatics Technology Suite", and two columns of descriptive text. At the bottom, there's a "Paramax" button, a "Paramax" logo, and a "Paramax" slogan: "Paramax. The best vehicle for high purity Phenol-Xylene production." The bottom right corner includes the Axens logo and the tagline "SERVICE • EXPERTISE • QUALITY • INNOVATION".

A photograph of a woman's knee wearing two blue and yellow Axens HydroTwisting Catchup knee braces. The braces are designed to wrap around the knee joint, providing support and stability. The background is a blurred indoor setting.

An advertisement for Axens. It features a man wearing a white hard hat with the Axens logo, a blue jacket, and a name tag, standing in front of a control room with multiple computer monitors displaying industrial data. In the background, there's a large industrial facility with tall towers and pipes under a cloudy sky. The overall theme is industrial engineering and technology.



Axens

89, boulevard Franklin Roosevelt - BP 50802
92508 Rueil-Malmaison Cedex - France
Tel.: +33 1 47 14 21 00
Fax: +33 1 47 14 25 00

www.axens.net