



# *Generating performance plus*



Axens' Performance Program, P<sup>2</sup>, provides services for new and existing plants in the refining and petrochemical industries. P<sup>2</sup> helps you to bring out the best in your assets by boosting plant operations to new levels and moving your plant toward its optimum economic potential.

P<sup>2</sup> provides major cost-effective improvement services for existing plants. Such services start with comprehensive plant-performance surveys incorporating recommendations for improvement and implementation. These are followed by master plans for modernizing the refinery process scheme and tools to enhance staff technical competence and response times, thereby limiting or eliminating costly unscheduled shutdowns.

P<sup>2</sup> can also accompany the investor through to the construction of a new asset by helping in making the right choices, whether during the pre-feasibility, the feasibility or the conceptual engineering phase.

P<sup>2</sup> applies half a century of Axens' experience to provide best-in-class services to squeeze that extra performance from your plant. It combines dedicated teams having strong technical know-how with a wealth of accumulated engineering experience and advanced computational techniques to provide high-quality performance programs.

# P<sup>2</sup> services



P<sup>2</sup> offers a customized approach, including tailored studies, audits and consulting services, covering technical and operational issues in the refining and petrochemical industries.

P<sup>2</sup> makes a positive economic difference through a variety of different services.

## Consulting services

### New asset studies

- Pre-feasibility studies
- Feasibility studies (technical and bankable)
- Conceptual engineering studies

### Existing asset optimization

- Master planning for existing assets
- Energy efficiency improvement and greenhouse gas (GHG) emission mitigation

### Specific consulting services

- Feedstock and product market analysis
- Crude opportunity studies
- Site location studies
- Petroleum terminal studies
- Preliminary environmental impact assessments (pre-EIA) and preliminary hazard assessments (pre-HA)

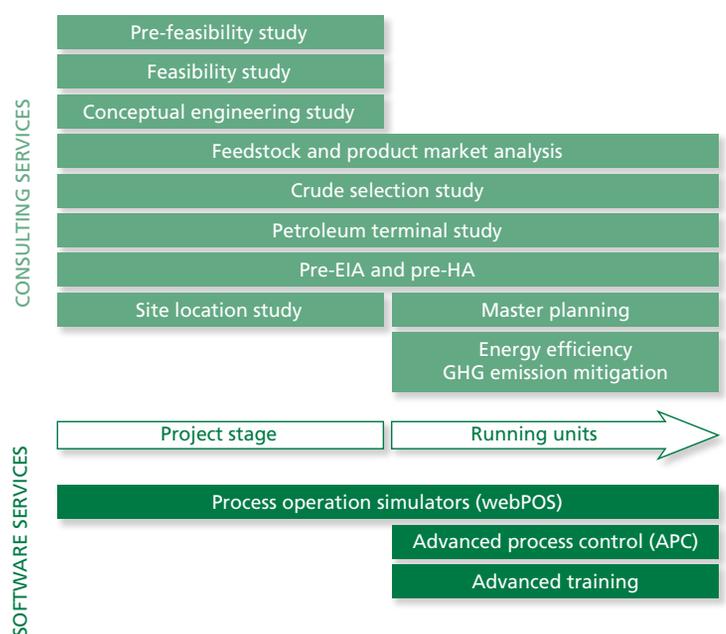
### Powerful consulting tools

## Software services

Process operation simulators (webPOS™)

Advanced process control (APC)

Advanced training





# Consulting services

*Improving efficiency and asset capabilities*



## New asset studies

Axens' proven methodology for project development, backed by world-class refining and petrochemical expertise and proprietary tools, provides a comprehensive, customized offer adapted to clients' specific requirements.

### Pre-feasibility studies

At the onset of a project, investors are faced with a multitude of options that need sorting and clarifying. Axens' pre-feasibility studies bring a global and coherent approach to the evaluation process. These studies comprise

- analyzing petroleum product and crude markets
- reviewing product specification developments
- assessing local environmental regulation compliance
- developing different viable process configuration options adapted to the available feedstock and the targeted product slate
- evaluating auxiliary units, utilities and off-site facilities
- making preliminary estimates of capital and operating expenditure
- ranking the different project options using the preliminary financial analysis.

Finally, the pre-feasibility study will deliver all the necessary information for selecting the best investment option.

### Feasibility studies (technical and bankable)

Following the pre-feasibility study, the main process units and the related assets of the selected scheme have to be developed in more detail. A feasibility study helps to define the different elements of the project that will satisfy financial institution requirements for project evaluation. These studies comprise

- preliminary design work and defining the
  - storage and blending facilities, off-site facilities and infrastructure, including marine facilities, seawater intake and outfall, and freshwater and oil pipelines
  - utility generation and distribution
  - hydrogen production, waste water and flue gas treatment facilities, and sulfur recovery units
- preliminary identification of environmental impacts and safety risks
- cost investment estimates based on Association for the Advancement of Cost Engineering (AACE International) Class 4 standards
- financial and risk analyses
- project finance.



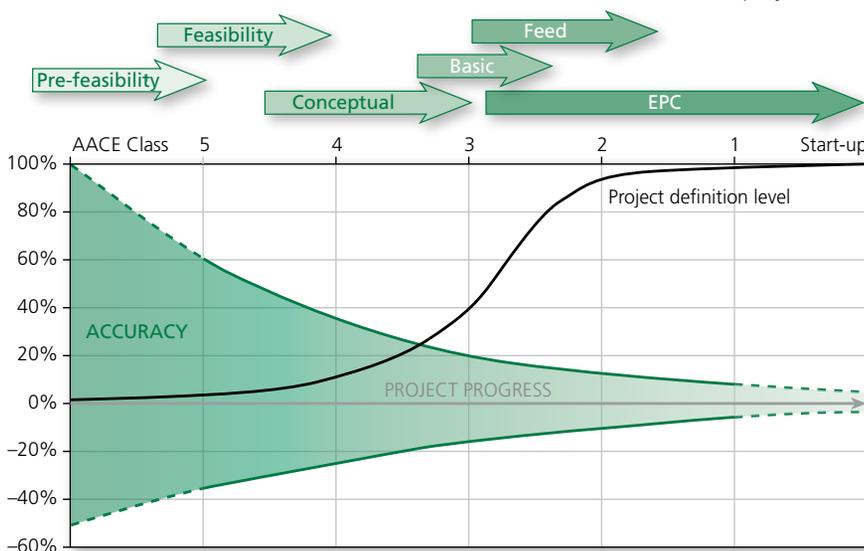
### Conceptual engineering studies

The P<sup>2</sup> conceptual engineering study methodology offers a holistic approach that covers the full project development and aims to bridge the gap between the preliminary studies and the basic engineering work. These studies comprise

- developing technical information on the basis of the conclusions from the previous study. The technical information is sourced from process licensors.
- integrating refinery support units by developing all the utilities, off-site facilities and infrastructure

- preparing engineering general documentation as the starting points for the next phases of the project: basic engineering and engineering, procurement and construction (EPC)
- pre-EIAs and pre-HAs
- cost investment estimates based on AACE Class 3 standards
- detailed financial analyses and project risk assessments
- developing the project execution plan
- determining the staffing requirements for project execution and asset operation.

A conceptual engineering study provides P<sup>2</sup> clients with all the documents required to issue the bids for the licensed technologies and the EPC contractor. This saves significant time and money on project execution.





## Optimization of existing assets

As well as offering engineering services for new projects, a P<sup>2</sup> program provides strategic reviews of existing operations, including master planning of existing assets and energy efficiency improvement and GHG emission reduction services.

### Master planning for existing assets

Existing assets are subject to evolving constraints, such as feedstock changes, tightening product specifications, changing product slates or new environmental regulations. P<sup>2</sup> can help Axens' clients to adapt their existing assets to a new business environment. The company's expertise covers all refining and petrochemical process technologies and provides a reliable source of data for reviewing process configuration options and maximizing the potential of existing assets.

## Energy efficiency improvement

Energy is a major contributor to operating costs. P<sup>2</sup> provides world-class expertise to help identify potential gains and implement a road map for minimizing energy consumption in refining and petrochemical plants.

Improving energy efficiency is currently the main lever used to reduce carbon dioxide emissions, it being the main GHG emission from refining activities. P<sup>2</sup> extends its energy efficiency improvement expertise to the identification and economic aspects of GHG reduction through tools such as the Clean Development Mechanism or Joint Implementation.<sup>1</sup>

<sup>1</sup>As defined by the United Nations Framework Convention on Climate Change



## Specific consulting services

### Site location studies

Site selection is based on a multi-criteria analysis that starts with identifying the requirements that influence the location of the new plant, followed by an assessment of the surroundings' physical, biological and socioeconomic impacts on the project. The client receives a ranking of the possible sites with the appropriate justifications.

### Feedstock and product market analyses

Axens has extensive knowledge of the crude oil, petroleum product and petrochemical markets. Its economists can provide customized market surveys for clients and valuable information, such as future product specifications, core product markets and export opportunities, for optimizing their assets.

### Crude opportunity studies

P<sup>2</sup> has access to a large crude assay database covering all the crude supply markets. This database, when combined with expertise in oil markets and refining and petrochemical technologies, enables P<sup>2</sup> to provide Axens' clients with a multi-criteria feedstock selection study. From these analyses, it is possible to identify an optimum crude slate based on all the current or future refinery characteristics.

### Petroleum terminal studies

Aside from the tank farms that are part of refinery construction projects, P<sup>2</sup> can design standalone petroleum terminals for crude oil and final products, either for regional consumption, trading business or strategic purposes.

### Preliminary environmental impact and hazard assessments

To cover all aspects of a project at the initial stage, P<sup>2</sup> produces, within the framework of the feasibility and concept studies, a review and analysis of the projected plant's potential safety and environmental risks, for example, hydrocarbon leaks, noxious gases and hazardous products.

The main issues addressed during the pre-EIA and pre-HA are

- preliminary evaluation, global analysis and cartography of impacts
- potential technologies and actions to avoid or mitigate the negative impacts of the project on the surroundings.

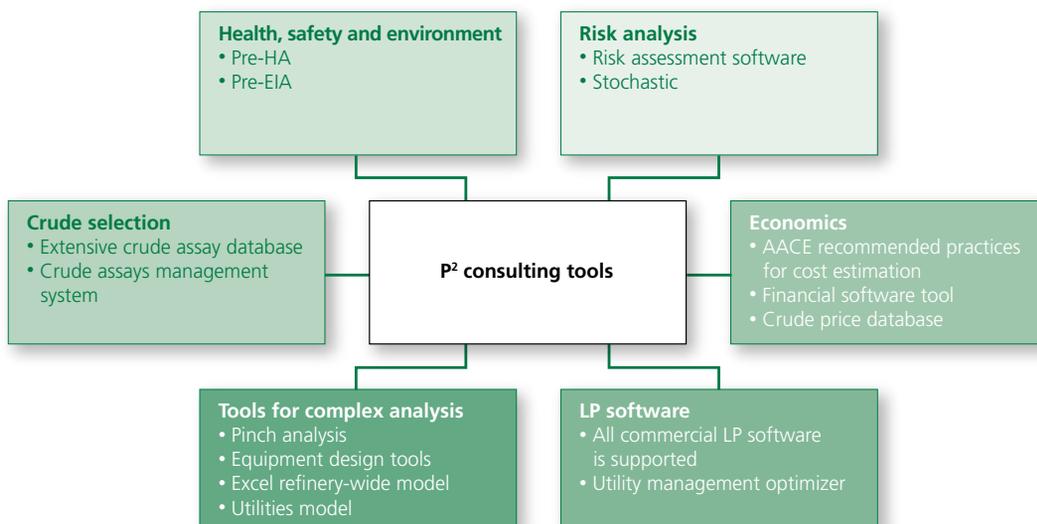


## P<sup>2</sup> consulting tools

Powerful tools, such as rigorous process modeling and linear programming (LP), are combined with in-house expertise to support strategic decision making. A multi-step methodology is applied:

1. data collection and validation
2. benchmarking
3. recommendations and implementation.

This approach provides reliable and customized solutions.



# Software services



## Process operation simulators

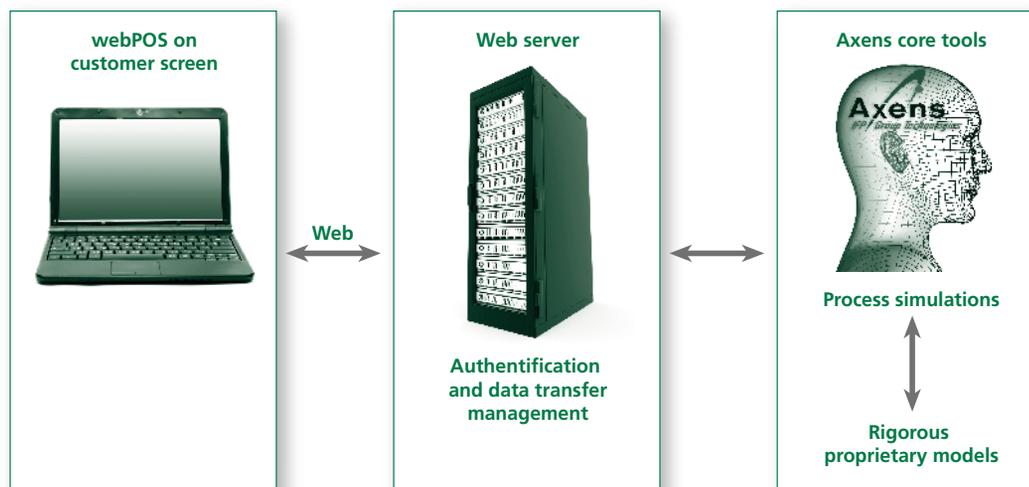
### Maximize performance through your operating and process engineering personnel

Operations and process engineers are a plant's frontline resources; high-quality performance from them depends on the quality of their knowledge and tools.

**Process operations simulators (webPOS)** boost an engineer's effectiveness to the next level. They offer the right solutions to help engineers analyze what-if scenarios, catalyst service life, utility costs, yields and equipment performance.

Axens' knowledge is shared with its clients through access to accurate and reliable tools that enable off-line optimization of operating plants.

webPOS programs are offered as Web-based applications that are easy to maintain and to update. They can be dedicated to individual units or cover a group of units, such as a complete aromatics complex.





## Advanced process control (APC)

### Fast payback with APC

As a process licensor and catalyst supplier, Axens has first-hand knowledge of the best strategies and approaches for APC projects.

P<sup>2</sup> makes clients' plants perform better and more safely with APC by

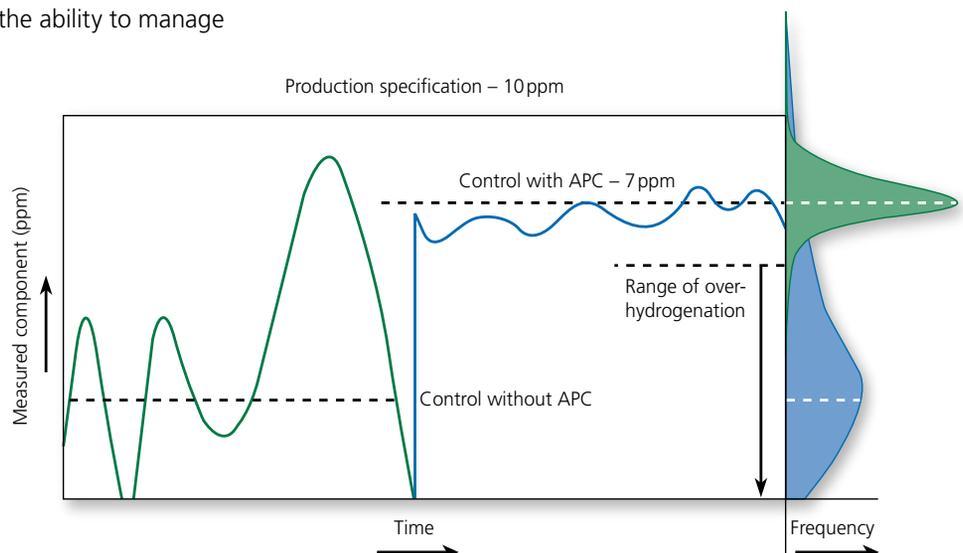
- extending catalyst performance and service life
- reducing utility and logistics costs
- saving energy and decreasing carbon dioxide emissions
- avoiding the problems caused by off-specification products.

As product qualities become more and more constrained, APC can pay off handsomely. Axens combines the ability to manage all phases of APC projects with the use of powerful computational resources, which include inferential modules, proprietary software packages, multivariable predictive controllers and an extensive database of chemical reaction kinetics and thermodynamics.

## Advanced training

Advanced training software is designed to support Axens' regular training sessions. The aim is to use interactive techniques to familiarize unit operators and support staff with process behavior when feedstock quality changes and/or product characteristics are modified.

The advanced training software consists of steady-state simulators based on rigorous models fully customized to clients' specific cases.





# *The performance improvement specialists*



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***Single source  
technology and  
service provider***

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