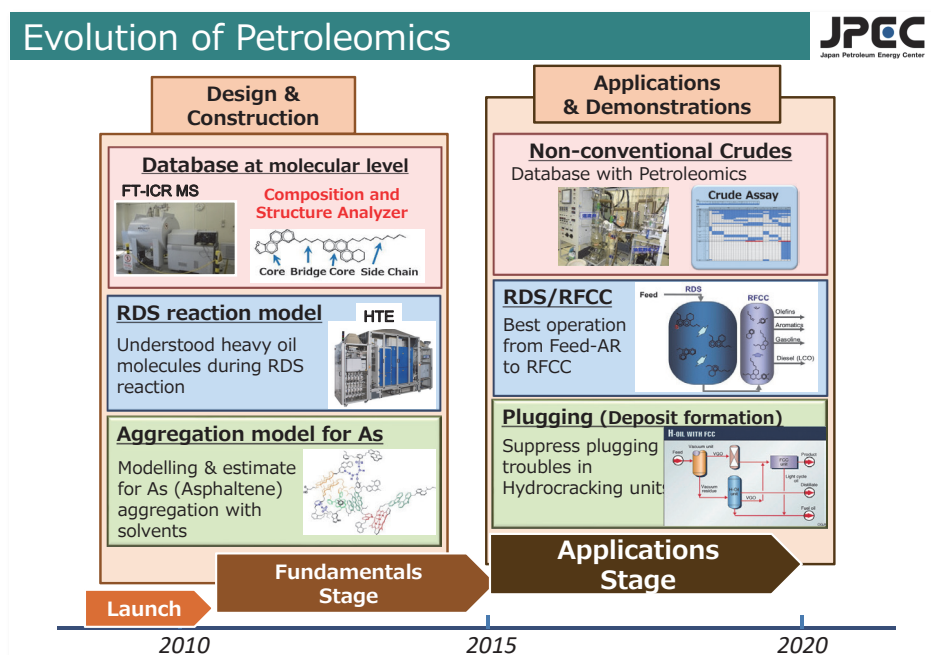
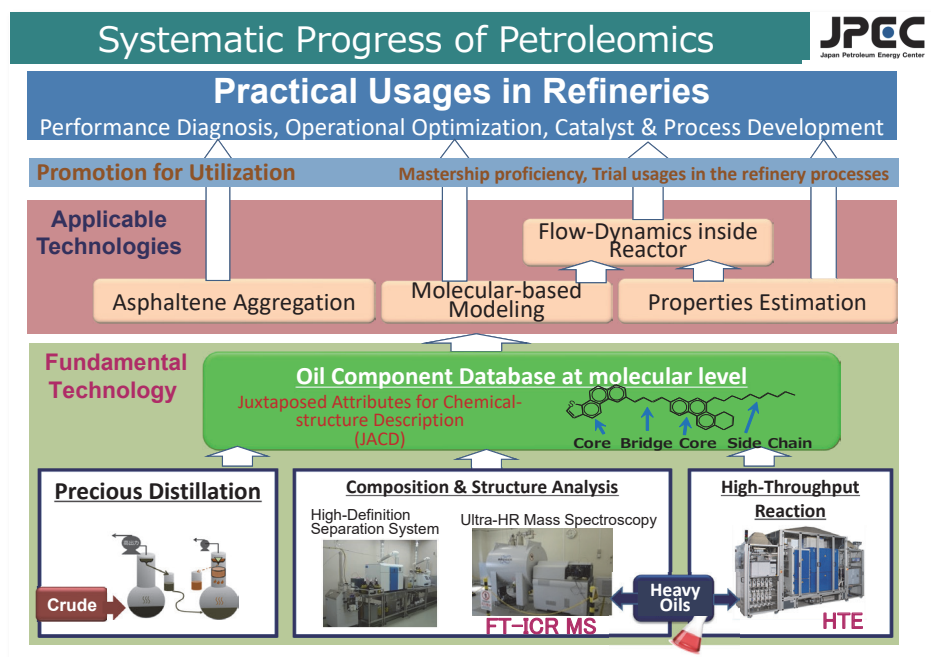


I Development of Production Technologies

To strengthen the international competitiveness of Japan's refineries, we are developing petroleum refining technologies to efficiently produce petroleum products. Developing technologies include using Petroleomics that are new technologies related to heavy oil research and development we are working on. We are also working to develop technologies that contribute to improving the reliability of refineries and technologies that will promote the use of hydrogen, which is key to energy security and global warming countermeasures for Japan, a country with few energy resources.

1. Refining Technologies

More efficient production of high value-added products from unconventional crude oils (noble use of petroleum) and the achievement of long-term operational stability of oil refining facilities are regarded as important issues that need to be addressed to strengthen the international competitiveness of refineries. Regarding the development of the fundamental technologies required to realize the above (structural analysis techniques for non-conventional crude oil and the like, optimization technology of heavy oil treatment process), we are aiming for commercialization and demonstration at refineries using the Petroleomics technology development achievements as fundamental technology. Further, we push forward technology development projects at demonstration and commercialization stages from oil refining companies on the base of intimate collaborations with the fundamental technology developments done at JPEC.

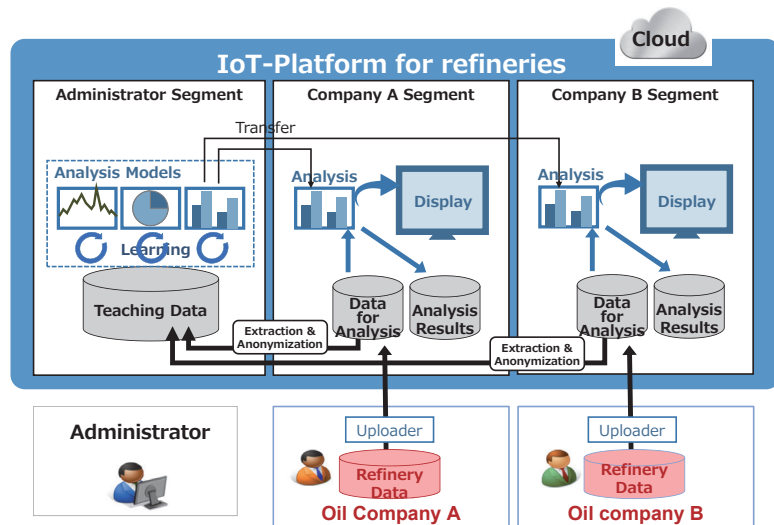


2. Operational Reliability on Refinery

An important way to strengthen the international competitiveness of refineries is to avoid operational availability decreases due to unplanned shutdowns and the like. Meanwhile, with the development of IoT technology and artificial intelligence (AI) technology such as deep learning in recent years, the collection and analysis of enormous amounts of data will allow the creation of new value at an unprecedented level.

Using these new technologies, JPEC is working on technology development aiming to achieve

both efficient and more flexible maintenance while improving plant equipment reliability. Specifically, we are conducting studies on piping corrosion analysis and equipment failure analysis models utilizing the vast amounts of data that refineries possess, and we are developing a platform for petroleum refining that will allow sharing and use of analysis models and data in the industry.

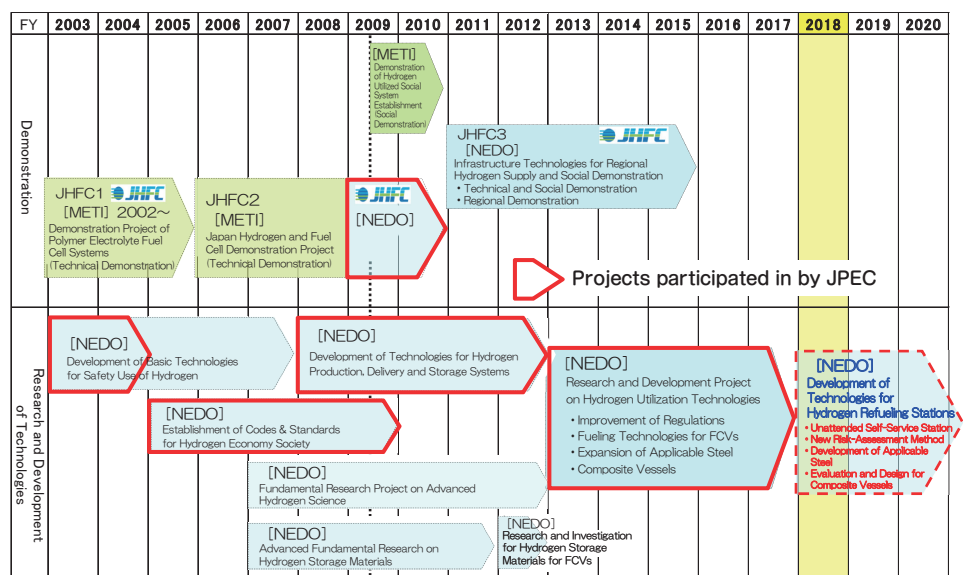


IoT-Platform for refineries

3. Hydrogen Energy

Along with enhancing the international competitiveness of refineries with large hydrogen production and supply capacity, we are working on a technological development projects related to hydrogen utilization in order to take full advantage of the strengths of the oil industry, which currently has a nationwide disaster-resistant, robust supply station infrastructure.

In this project, toward the dramatic expansion of hydrogen utilization, we are conducting research on the construction of a low-cost hydrogen supply infrastructure utilizing ultra-high pressure hydrogen technology, and we are reviewing regulations and establishing technical standards that will reduce station maintenance and operation costs.



JPEC's Approach to NEDO Research and Development Projects for Hydrogen Supply Infrastructure Establishment
NEDO: New Energy and Industrial Technology Development Organization