

28 November 2022

**Chiyoda teams up with Axens to unlock hydrogen supply chain issue
with the combination of Chiyoda's SPERA Hydrogen technology and Axens' toluene
hydrogenation Technology**

Chiyoda Corporation (Chiyoda) is pleased to announce the signature of a Joint Commercial Cooperation Agreement (JCCA) with Axens. The purpose of this cooperation is to facilitate hydrogen supply chain projects via methylcyclohexane*¹ (MCH) as Liquid Organic Hydrogen Carrier (LOHC) and promote a combination of Chiyoda's SPERA HydrogenTM technology and Axens' Toluene Hydrogenation technology.

According to the International Energy Agency (IEA), the size of the hydrogen economy could be as large as 150 million tons annually in 2030. The hydrogen long distance transportation from favorable areas of production to main consumption countries remains a key challenge to be addressed from technical and economical point of view.

Chiyoda's SPERA Hydrogen technology utilizes MCH as a LOHC and with Chiyoda's proprietary dehydrogenation catalyst, it produces hydrogen and toluene from MCH with high conversion and high selectivity.

Axens' Toluene Hydrogenation technology uses high performance homogeneous catalysis resulting in high purity MCH production from toluene and hydrogen with optimized energy efficiency. This technology is backed up by Axens' unmatched experience in the field of hydrogenation through process optimization and extensive catalyst development.

The combination of both technologies through the JCCA will:

- bring strong synergies allowing fast track approach for project implementation; and
- provide a single point of contact to reduce the burden of customer coordination between two licensors.

This JCCA based on the usage of proven technologies using MCH as a LOHC will help the emergence of the hydrogen market while mitigating:

- issues linked to safety and difficulties of hydrogen transport and storage; and
- technology cost intensity by using existing infrastructure, regulations, and standards.

Chiyoda is currently implementing 'Chiyoda's Revitalization Plan - Initiatives for Revitalization and the Future' in May 2019 and 'Revitalization Plan Update' in May 2021. This JCCA will be a major contribution to defining "new values" in engineering and visions highlighted in the two documents. It will also be a significant milestone towards achieving Chiyoda's goal of contributing to a carbon neutral society by 2030 through business portfolio innovation.

Furthermore, Chiyoda and Axens will jointly develop hydrogen markets in the area of Europe, Japan, North America, Asia, Oceania, etc. This joint development allows Chiyoda to further accelerate the expansion of its hydrogen supply chain business, contributing to energy transformation and long-term CO₂ emission reductions towards global decarbonization and a sustainable future environment.

*1: methylcyclohexane

A chemically stable liquid produced from toluene and hydrogen that can be handled in a liquid state at ambient temperature and pressure. It is widely used as pharmaceutical agent, solvent for agricultural production, admixture for jet-fuel, solvent for correction liquid, etc.

< Reference Information >

1. About Chiyoda Corporation

- Headquarters: 4-6-2 Minatomirai, Nishi-Ku, Yokohama-Shi, Kanagawa 220-8765, Japan
- Established: 1948
- Main Business: Integrated engineering including consulting, planning, engineering, procurement, construction, commissioning, and maintenance for facilities related to gas, electricity, petroleum, petrochemical, chemical, pharmaceutical, antipollution, environment, preservation, and other services.
- Representative: Mr. Masakazu Sakakida, Chairman of the Board, President & CEO

2. About Axens

- Headquarters: 89, Boulevard Franklin Roosevelt, 92500 Rueil-Malmaison, France
- Established: 2001
- Main Business: Solutions for the conversion of oil and biomass to cleaner fuels, the production and purification of major petrochemical intermediates, the chemical recycling of plastics, all natural gas treatment and conversion options along with water treatment and carbon capture. The offer includes technologies, equipment, furnaces, modular units, catalysts, adsorbents, and related services.
- Representative: Mr. Jean Sentenac, Chairman of the Board, CEO
- Website: www.axens.net
- Press contact: press@axens.net

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