

Hitachi Construction Machinery Co., Ltd.
 Nihon Techno Co., Ltd.
 Koatsu Gas Kogyo Co., Ltd.
 Dowa Thermotech Co., Ltd.

Japan's First Demonstration of the Effectiveness of Atmospheric Pressure Smart Carburizing Technology in Eliminating Direct CO₂ Emissions in the Gear Manufacturing Process



Carburizing furnace equipped with atmospheric pressure smart carburizing technology

Tokyo, May 8, 2025 – Hitachi Construction Machinery Co., Ltd. (President and Executive Officer Masafumi Senzaki; "Hitachi Construction Machinery"), Nihon Techno Co., Ltd. (President and Representative Director Hitoshi Kabazawa; "Nihon Techno"), Koatsu Gas Kogyo Co., Ltd. (President and Representative Director Motonari Kuroki; "Koatsu Gas Kogyo"), and Dowa Thermotech Co., Ltd. (President and Representative Director Koki Kagawa; "Dowa Thermotech") announced that they have demonstrated the effectiveness of "Atmospheric Pressure Smart Carburizing Technology" (the "technology"), which can eliminate direct CO₂ emissions generated by carburizing furnaces during the manufacturing process for gears incorporated in the reduction gear units of hydraulic excavators, for the first time in Japan*¹.

*1: According to a survey conducted by Hitachi Construction Machinery, Nihon Techno, Koatsu Gas Kogyo, and Dowa Thermotech as of May 8, 2025.

Carburizing is a technique for heat treating metal*² which introduces carbon into the surface of a low-carbon steel part that has been heated to a high temperature (approximately 850 to 950°C) and then rapidly cools the part to harden the surface. The carburizing technique is widely applied to parts used in automobiles, machinery, etc. for its ability to improve wear resistance and fatigue strength as well as increase durability.

A typical gas carburizing (Figure 1) uses a hydrocarbon-type gas (propane, methane, butane) as the source gas and a converted gas (carbon monoxide, hydrogen, nitrogen) generated from the atmosphere to carburize metal. Under this method, CO₂ is emitted from the carburizing

furnace due to the carburizing reaction and the exhaust gas combustion reaction. In the manufacturing process for hydraulic excavator reduction gear units and other types of equipment, CO₂ emissions are highest in the heat treatment process for metal parts with gas carburizing accounting for the largest proportion of those emissions.

*2: A processing technique that improves mechanical characteristics such as wear resistance and fatigue strength by cooling metals heated at various temperatures within gases.

The technology jointly developed by Nihon Techno and Koatsu Gas Kogyo (Figure 2) directly introduces carbon into the surface of steel by controlling the flow rates of acetylene gas and nitrogen gas with an acetylene gas concentration analyzer manufactured by Horiba, Ltd. Since the technology does not use converted gases, which are the source of CO₂ generation, it eliminates direct CO₂ emissions and reduces the annual CO₂ emissions of each carburizing furnace by 56 tons. Furthermore, since gas conversion furnaces typically operate for 24 hours a day, electricity charges and maintenance costs can also be reduced. In addition, this technology can be used with existing carburizing furnaces, so there is no need to install new equipment, and reductions in initial investment can be expected.

In the recent demonstration experiment, the four companies applied the technology to gears incorporated in the reduction gear units of 20-ton class hydraulic excavators and demonstrated that the improvements in wear resistance and fatigue strength were equivalent to a typical gas carburizing process.

Going forward, the four companies will continue developing the atmospheric pressure smart carburizing technology with the goal of implementation.

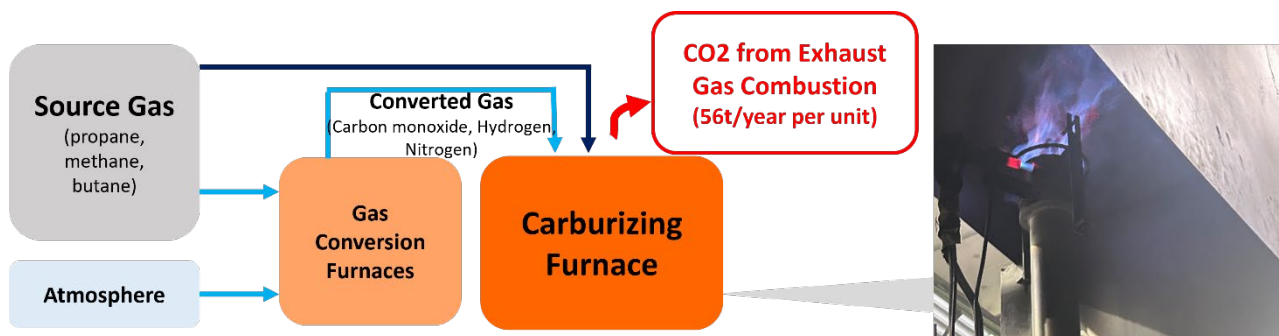


Figure 1: Typical gas carburizing

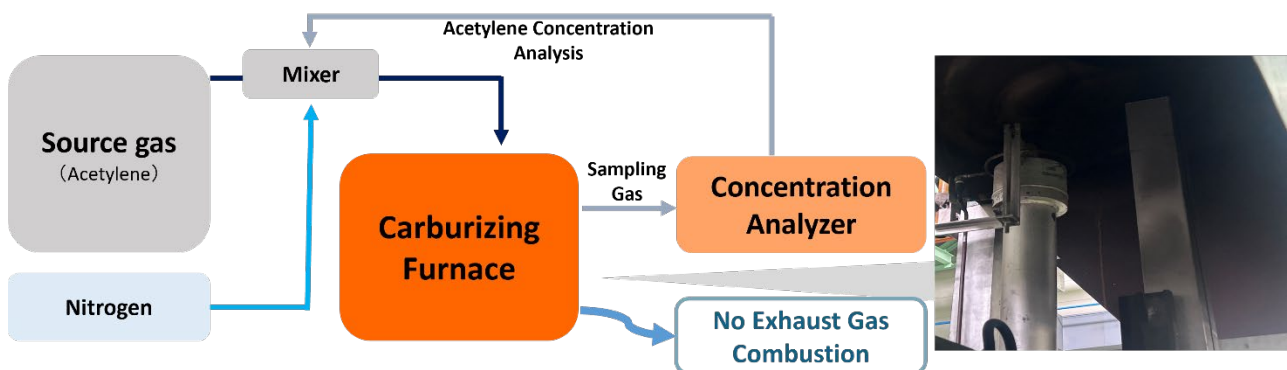


Figure 2: Atmospheric pressure smart carburizing



Gears incorporated in the reduction gear unit of a hydraulic excavator

■ Overview of the demonstration experiment

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|----------------------|---|---|
| Demonstration site | Hitachi Construction Machinery Hitachinaka Works (Hitachinaka City, Ibaraki Prefecture) | |
| Demonstration period | October 2024 to February 2025 | |
| Experimental method | The atmospheric pressure smart carburizing technology was applied to gears incorporated in the reduction gear unit of a 20-ton class hydraulic excavator to demonstrate that the improvements in wear resistance and fatigue strength were equivalent to a typical gas carburizing process. | |
| Role of each company | Hitachi Construction Machinery | Overall coordination, furnace loan |
| | Nihon Techno | Development of the technology |
| | Koatsu Gas Kogyo | Development of the technology, provision of the acetylene gas |
| | Dowa Thermotech | Provision of carburizing furnace information, modification of existing carburizing furnaces |

About Hitachi Construction Machinery Co., Ltd.

Hitachi Construction Machinery Co., Ltd. (TSE: 6305), headquartered in Tokyo, Japan, is a construction machinery manufacturer that globally deploys development, manufacturing, sales, and service businesses for its hydraulic excavators, wheel loaders, compaction equipment, and mining machinery, etc. In addition to its new machinery business, Hitachi Construction Machinery is expanding its "value chain businesses" of parts and services, remanufacturing (parts and machines), rentals, and used equipment as it aims to grow together with customers as a true solutions provider that offers innovative solutions to customers. As our vow to all stakeholders to achieve this mission, we established and are currently disseminating and promoting the LANDCROS as our new concept. With roughly 26,000 employees around the world, the consolidated sales revenue for Hitachi Construction Machinery was 1,371.3 billion

yen for fiscal year 2024 (ended March 2025) with an overseas sales revenue ratio of 84%. For more details, please see [the company's website](#).

About Nihon Techno

Nihon Techno manufactures and sells heat treatment equipment and provides heat treatment contract processing services. The company aims to contribute to the safety, energy conservation, labor saving, and carbon neutrality of heat treatment users with acetylene control technologies including atmospheric pressure smart carburizing.

In addition, the company uses ammonia, hydrogen, sulfur, oxygen, and various other gas atmosphere control technologies to meet the required functionality. Since its founding in 1985, Nihon Techno has continued to solve customer problems through ceaseless technology development and grow together with its customers for 40 years.

About Koatsu Gas Kogyo

In addition to expanding its manufacturing and sales bases nationwide and expanding its group companies since its founding as a top Japanese manufacturer of acetylene gas in 1958, Koatsu Gas Kogyo has expanded its business by enhancing its product lineup while growing its chemical products business, IT solution business, and other business areas. Based on the founding spirit of "Harmony among people, technology, and the environment in pursuit of endless possibilities.," the company makes "safety and security" the basic stance of everything that they do, and their goal is to consider and solve the issues facing people, their lifestyles, and society. As part of that goal, the company formulated its five-year medium-term management plan titled "Change & Challenge Stage II" in June 2021. In addition to enhancing its existing businesses based on five growth strategies, the company will develop new products, pioneer new markets, and engage in diversified business development to address various social issues.

About Dowa Thermotech

Dowa Thermotech is a comprehensive manufacturer of heat treatment solutions headquartered in Nagoya City, Aichi Prefecture. Founded in 1958 with locations in Japan and overseas, the company designs, manufactures, sells, and maintains heat processing equipment as well as provides contract processing services for various types of surface treatment according to the application. With a total support system for heat treatment technology that emphasizes environmentally friendly technologies, Dowa Thermotech supports customer development and the evolution of manufacturing while contributing to the realization of a low-carbon society.

Information contained in this news release is current as of the date of the press announcement, but may be subject to change without prior notice.