

# Distinguished Education and Research

## Research into development and practical application of compact, lightweight electric motorization systems

(Project duration: 2020 to 2023)

Today's aircraft are typically controlled by a combination of electricity, air pressure and oil pressure. These mechanisms are complex and require continuous maintenance. It therefore makes sense to look for ways to utilize electrification throughout the engineering process as a whole. Electrification of the propulsion mechanism is one approach to reducing carbon dioxide emissions. This is a key focus for Akita University. We are actively engaged in promoting research activities through the Akita Research Initiative, involving volunteer researchers from both Akita University and Akita Prefectural University. As well as this, both universities are collaborating with local industries in the "Industrial creation initiative based on R&D for compact and lightweight electrification systems" which can be applied to automated vehicles in general, including aircraft. The project was selected for a Grant for Regional Universities and Regional Industry Revitalization for 2019 by the Cabinet Office. In April 2021, the University established the Joint Research Center for Electric Architecture, operated jointly with Akita Prefectural University. The center will play a leading role in promoting research and development and contributing to the development of local human resources and industry.

In April 2022, we opened a major research facility, the Evaluation Laboratory for Next Generation Motors. This laboratory is used for performance evaluation testing, endurance testing (environmental resistance tests) for motorized equipment and systems testing using the grid (power lines). It is available for use both by local companies and for companies from further afield.

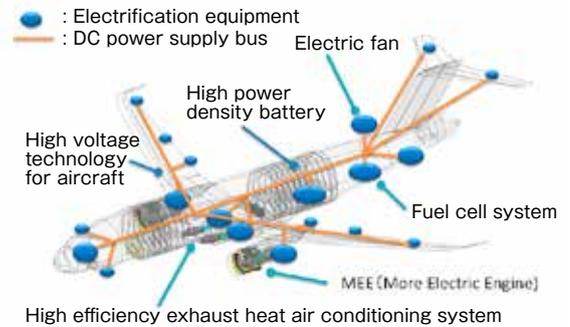
In March 2023, in collaboration with Akita Prefectural University, IHI Corporation, and local companies in Akita, we successfully developed a prototype 250kW aircraft propulsion system high output electric motor (Halbach motor).



One of the largest motor characteristics testing facilities in Japan

\*Establishment of Evaluation Laboratory  
for Next Generation Motors

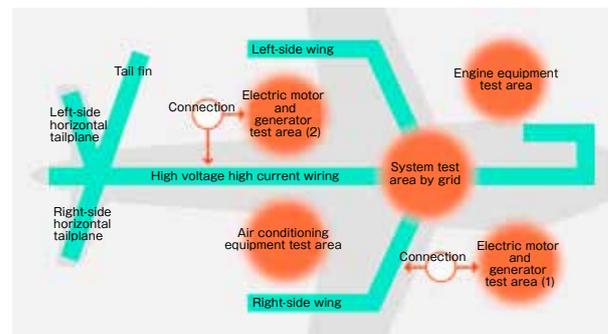
(Example of electrification system for 2030)



Source: IHI Corporation website



(Full-size aircraft frame test facility)



Source: Evaluation Laboratory for Next Generation Motors website  
<https://www.akita-u.ac.jp/dendouka/motorlab/ja/about/>



A panoramic view of the system test equipment  
(known as copper pheasant) using the grid

\*Establishment of Evaluation Laboratory for Next Generation Motors

You can find more information on the following websites and the dedicated YouTube channel.

Joint Research  
Center for Electric  
Architecture



Japanese  
version



English  
version



YouTube channel

Evaluation  
Laboratory for Next  
Generation Motors



Japanese  
version



English  
version

# Distinguished Education and Research

Ministry of Education, Culture, Sports, Science and Technology (MEXT) Project for the establishment of university fellowships for the creation of innovation in science and technology

“Cultivation of Advanced Resource Sciences-related Doctoral Students with the Integration of the Humanities and Sciences to Contribute to Achieving SDGs”

(Project duration: 2020 to 2027)

The Akita University Fellowship is a program to support doctoral students who will develop the science, technology, and innovations of the future, as we look to nurture high quality human resources who contribute to the achievement of the SDGs and carbon neutrality.

This program has been adopted by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) for the establishment of university fellowships for the creation of innovation in science and technology.

#### 1. Initiatives to improve research capabilities

- i) Help doctoral students to share opinions and gain mutual understanding through opening an “information exchange lounge” and creating a database of research activities.
- ii) Organize regular research presentations to improve research capabilities.
- iii) Set up research internships based on research collaboration with companies.

#### 2. Initiatives to help career progression after completion of doctoral degree

- i) Matching doctoral students’ research activities to company requirements via a database

#### 3. Financial support for students

- i) Value of assistance provided:  
Dedicated research subsidy (equivalent to living expenses) 150,000 yen per month  
Research costs 300,000 yen per year
- ii) Number of doctoral students eligible for support: 8 per academic year

#### 4. Implementation



For more information, please see the following websites



Japanese version



English version

Inter-University Exchange Project - Supporting the development of inter-university exchanges with African countries -

“An innovative program for development of core human resources for smart mining to lead sustainable resource development in Southern Africa”

(Project duration: 2020 to 2024)

Akita University’s project, “Development of core human resources for smart mining to lead sustainable resource development in Southern Africa” has been selected for the MEXT (Ministry of Education, Culture, Sports, Science and Technology) Inter-University Exchange Project. This collaborative project involves Kyushu University (affiliated university) and Hokkaido University (partner university), aiming to train global experts in resource development science (Smart Mining) through Information Engineering with a focus on the core technology of Society 5.0 (such as AI, IoT, and Big Data).

Specifically, students acquire practical knowledge and skills related to smart mining from the undergraduate to master’s level through a curriculum that includes “Virtual Traveling Classes”, “Basics of Mining Informatics”, “Collaborative Training of Dig-Mine” and “Collaborative Research Project.”

The curriculum includes exchange programs between Southern Africa and Japan, which provide opportunities for mining site visits. As anticipated restrictions for face-to-face activities due to COVID-19, this project contains online programs actively.

Domestic affiliated and partner institutions:

Akita University (representative), Kyushu University (affiliated university), Hokkaido University (partner university)

Overseas affiliated institutions:

University of the Witwatersrand (South Africa)

The University of Zambia (Zambia)

Instituto Superior Politécnico de Tete (ISPT) (Mozambique)

Botswana International University of Science and Technology (BIUST)(Botswana)

University of Botswana (Botswana)



For more information, please see the following websites



Japanese version



English version

## Core to Core Program “Establishment of Research and Education Hub to Develop Young Researchers on Mining Informatics for Sustainable Resource Development in Middle Asian Countries”

(Project duration: 2021 to 2023)

JSPS adopted the University’s project, “Establishment of Research and Education Hub to Develop Young Researchers on Mining Informatics for Sustainable Resource Development in Middle Asian Countries” as a Core to Core Program (B. Asia-Africa Science Platforms).

The purpose of this project is to cultivate young resource information researchers through building educational and research foundations and deepening mutual exchanges with representative universities in five Central Asian countries that, regardless of whether or not they have been positioned as a frontier area in new resource development, have high underground resource reserve potential (especially mineral resources), and yet experience a shortage of personnel with advanced technological and planning capabilities for resource development.

Specifically, Japan and overseas hubs will conduct joint research, hold seminars and symposiums, researcher exchanges and other activities.

Japan-based institution: Akita University

Partner institutions in Japan: Hokkaido University, Kyushu University, and University of Tsukuba

Overseas institutions and partner organizations:

Mongolian University of Science and Technology (Mongolia)

Nazarbayev University (Kazakhstan)

Navoi State Mining Institute, Uzbek-Japan Innovation Center of Youth (UJICY) (Republic of Uzbekistan)

National Academy of Sciences of Tajikistan (including Mining-metallurgical Institute of Tajikistan) (Republic of Tajikistan)

- Kyrgyz State University of Geology, Mining and Natural Resources Development, named after Academician U. Asanaliyev (Kyrgyz Republic)



For more information, please see the following websites



Japanese version

## JICA/JST Science and Technology Research Partnership for Sustainable Development

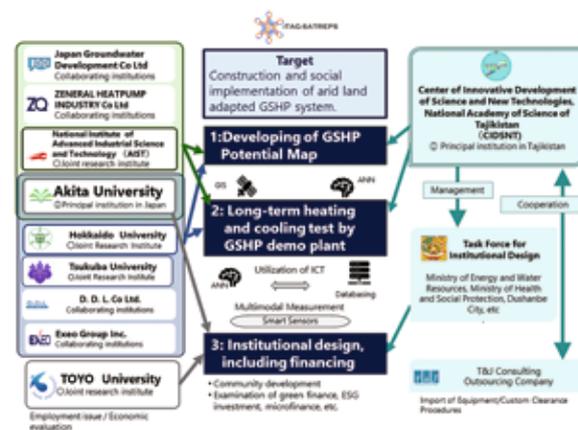
### “Construction of a Decarbonized Heat Energy Supply System using Groundwater Resources”

(Project duration: 2021 to 2026; 2021 was a preparation year)

This research aims to contribute to regional stability and countermeasures for global warming through improving energy conditions and creating jobs by building and popularizing the “Advanced Arid Region Geothermal Heat Pump System (Tajikistan Model)” integrating ICT technology, including AI, in Tajikistan, a country that suffers from temperature extremes and does not have significant oil and natural gas resources. Specifically, the project focuses on the following three research topics:

- (1) Development of groundwater flow and heat transport model based on field surveys, GIS data and AI for maps of potential use of geothermal and groundwater heat energy.
- (2) Implementation of long-term heating and cooling tests using a demonstration plant based on multi-modal measurement and AI.
- (3) Planning a system for dissemination of the “Tajikistan model.”

The plan is to develop an optimal geothermal heating and cooling system based on (1) and (2) using AI, which will be reflected in the system planning for (3). In addition, the project involves working with stakeholders to develop and introduce a system for the industrialization of geothermal systems and the creation of jobs as a result, including the provision of financing.



For more information, please see the following websites



Japanese version



English version