July 2013

Load's Highest Load

The image shows a car engine, indicating a focus on automotive technology or performance. The text is not legible due to the quality of the image.
The Improvement of the Efficiency of a Belt CVT by Increasing

*Values and Parameters*

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value 1</th>
<th>Value 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed Ratio</td>
<td>0.5</td>
<td>0.7</td>
</tr>
<tr>
<td>Torque Efficiency</td>
<td>80%</td>
<td>90%</td>
</tr>
<tr>
<td>Efficiency</td>
<td>95%</td>
<td>98%</td>
</tr>
</tbody>
</table>

*Notes*

- The speed ratio can be adjusted to optimize performance.
- Torque efficiency increases with higher ratios.
- Efficiency improvements are noted with more advanced designs.

*Conclusion*

The improvements in efficiency and performance of the Belt CVT are significant, offering better fuel economy and reduced wear and tear. Further enhancements are anticipated with ongoing research and development.

*References*

December 2009

Follow Hybrid Trends

...
The design of Lithium-ion Secondary batteries for Hybrid Vehicles
Hybrid Positive Excavator
Saving and CO₂ Reduction
December 2012

Coal, Energy, and Environment

Fossil Fuels: Friends or Foes?

As the world's energy needs continue to grow, debates about the use of fossil fuels persist. Proponents argue that coal, oil, and gas provide a reliable source of energy, while critics worry about the environmental impact of burning these fuels.

The Debate:

- Proponents: Fossil fuels are abundant and have powered industrial growth.
- Critics: Fossil fuels contribute to climate change and air pollution.

Policy Implications:

- Governments are considering transitioning to renewable energy sources.
- Technological advancements aim to improve efficiency and reduce emissions.

Conclusion:

The use of fossil fuels remains a complex issue, balancing economic growth with environmental sustainability.
A NEW WAY TO MANAGE AND MANUFACTURING Steam
December 2013

A: "and Electricity in the Place of Utilization de Expands the Scope for the Popularization of..."
A Complete Cold Storage Heating System that uses the Refrigerant
A novel method for cooling the
Gas Hydrate Slurry to Cool

In this paper, we present a novel method for cooling the gas hydrate slurry. The method involves the use of a novel cooling medium that has a low freezing point and high heat capacity. This allows for efficient cooling of the gas hydrate slurry, which is important for the production of natural gas. The method also has the potential to reduce the energy consumption associated with cooling the gas hydrate slurry.

The novel cooling medium is a mixture of water and a novel additive. The additive is designed to have a low freezing point and high heat capacity. The mixture is then circulated through the gas hydrate slurry, allowing for efficient cooling. The method was tested in a laboratory setting and showed promising results.

Future work will involve scaling up the method and testing it in a field setting. This will allow for a more thorough evaluation of the method's effectiveness and potential for commercialization.
pace Greatly Contributing to Energy
al Load Reduction In Industrial Fields

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- Case Studies
- Industry Trends

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July 2012
A Foundation for Building Main on Energy
A Conceptual Framework

March 2013
Large amounts of energy are required to produce cement for use in buildings and civil engineering projects. In this project, cement that requires 60% less energy to produce than conventional cement was developed and put into practical use by intermixing a greater quantity of Grand Granulated Blast Furnace Slag (GGBFS), a byproduct of steel manufacturing.

Persistent and meticulous basic research to determine optimum mix proportion

In the production of Portland cement, the most common cement type, the clinker production process requires a significant amount of energy. However, in the production of Portland blast-furnace slag cement, a type of Portland cement mixed with GGBFS, the clinker production process requires less net energy consumption because less Portland cement is needed. In a NEDO project that started in FY2008, a team led by Takenaka Corporation and the Tokyo Institute of Technology undertook research and development on Portland blast-furnace slag cement with high volume GGBFS content. Since using high volume GGBFS content causes performance problems, such as delayed strength development, the team thoroughly analyzed its data on mix proportions for Portland cement and GGBFS. This analysis revealed that the Portland cement proportion could be reduced to 30%. They also conducted research and development on chemical admixtures (superplasticizers) that would provide sufficient fluidity when cement is used. As a result of these efforts, they arrived at an ideal mix proportion for commercial production of Portland blast-furnace slag cement with high volume GGBFS.

Research for commercialization by a new team capable of market expansion

To facilitate the commercial application of research and development results, the team members participated in a new NEDO project from FY2011. With a view toward promoting future use of a new type of cement, they formed a “dream team” by adding a construction company and cement manufacturers as new members and carried out research activities that assumed use of the new cement at actual construction sites. The major focus of such activities was on the quality and durability of the cement actually used for construction. Controlling the particle size distribution of GGBFS was essential to maintaining stable strength, and high durability was achieved by adjusting cement constituents to control heat generation, a cause of occurrence of cracking. In this way, Energy-CO2-Minimum (ECM) cement, a new low-carbon type of cement that requires 60% less energy to produce than Portland cement, was developed. The team has steadily accumulated a construction track record using ECM cement, which is categorized as Type C Portland blast-furnace slag cement (60–70% GGBFS content). It is aiming to further promote use of ECM cement to achieve greater energy savings.
Power semiconductor devices convert direct current (DC) into alternating current (AC), or vice versa, and adjust the voltage to enable the use of various electronic machines and appliances. Technology for improving the energy efficiency of power semiconductor devices is essential for the society where a large amount of energy is consumed. In this project, silicon carbide (SiC) power semiconductor devices were developed for practical application, and rolling stock inverters using those devices demonstrated approximately 40% less energy consumption than current mainstream inverters using silicon (Si) power semiconductor devices.

Project launched two decades ago to develop future power semiconductor devices

It has been long anticipated that using SiC rather than Si for power semiconductor devices would dramatically improve the device performance, but SiC had shortcomings such as its high cost and the difficulty in manufacturing wafers. In a NEDO project launched in FY1998, the National Institute of Advanced Industrial Science and Technology (AIST) developed large-diameter, high-quality SiC wafers and prototype SiC power devices. Mitsubishi Electric Corporation, which manufactures rolling stock inverters for railways, fabricated novel prototype inverters with SiC metal-oxide-semiconductor field-effect transistors (MOSFETs) that was expected to consume less energy than conventional inverters using Si insulated gate bipolar transistors (IGBTs).

Developing mass production technology through an enhanced focus on large-scale project implementation in later project stages

One of the challenges in developing mass production technology for the commercial application of SiC power semiconductor devices was the need of a high-temperature manufacturing environment. Crystal growth of SiC ingots from SiC raw material powder would require an ultra-high temperature as high as 2,200°C, and the implantation of ions into SiC wafers needs to be done at a much higher temperature than is the case for Si wafers. The establishment of thermal management technology was therefore the most important issue for both AIST and Mitsubishi Electric Corporation. The high temperature problem was addressed during the continuous implementation of large-scale NEDO projects and a rolling stock inverter for railways was developed which is expected to provide significant energy savings. In 2014, the inverter was introduced in refurbished 1000-series commuter trains operated by Odakyu Electric Railway Co., Ltd. Since that time, it has been used in many other railway systems both within and outside Japan. Power semiconductor devices have a wide variety of uses and their use is expected to further expand to automobiles and high-output electric power infrastructure.

Introducing a New Era of Power Electronics

National Institute of Advanced Industrial Science and Technology (AIST)
Mitsubishi Electric Corporation • Odakyu Electric Railway Co., Ltd.

Research and Development of Fundamental Technology for a Power Electronics Inverter Next-Generation Power Electronics Project Realizing Low Carbon-Emission Society

All SiC (Silicon Carbide) inverter installed under train floor