

# CSR Highlights

Casio is committed to frankly reflecting on itself as a public entity, and is constantly re-envisioning its own future contribution to society.

Casio values persistent questioning: “What is this for? Who is it for? Why are we doing this? What needs improvement? And to what degree?”

The questioning doesn’t stop there, however. Casio goes on to ask: How original is this approach? Does the project have a clear focus on sustainability? Has it really given customers happiness and delight? Have we provided value that inspires new trends in the culture?

Casio people ask themselves questions like these every day. The following pages provide an overview of Casio’s CSR initiatives. We invite you to explore this unique Casio process and take note of its outstanding results.

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# Research & Development Next Generation Fuel Cell

## Original Casio Technology— Reformed Methanol Fuel Cell System

Casio is striving to realize a truly mobile society by developing micro fuel cells that can produce electrical energy from methanol.

Global research in this field is highly competitive, and various methods have been proposed. Casio has developed and recommended the Reformed Methanol Fuel Cell System, a technology that combines the high power output and environmental friendliness required for the mobile devices of the future.

The basic mechanism of this sophisticated technology involves extracting hydrogen from methanol, a type of alcohol, and then converting it into electricity. (Figure 1)

The mechanism behind this technology has been known for many years, but before Casio, most scientists have never thought it to be viable.

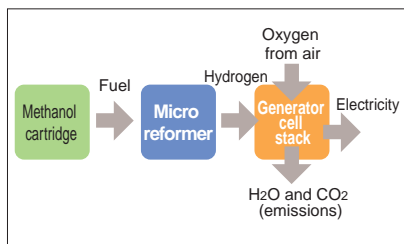


Figure 1: Basic Mechanism

## Development of the Micro Reformer Module

The most difficult phase of this development project was inventing the reformer (photo 1, right), which extracts hydrogen from methanol. Casio applied its expertise in semiconductor processing—a long-time core competency—and combined it with the latest nano catalyst and chemical reaction technologies to develop a successful micro reformer module.

Casio's latest module, announced to the public in spring 2006, integrates three chemical reactors that produce hydrogen and render emissions harmless and a heater/temperature sensor on a single chip, which achieves startup in just six seconds. The module also boasts a thermally insulated construction that keeps the outer surface of the device at only 40°C, despite internal heat of up to 280°C. The module's specifications are fully compatible with mobile device requirements.

## Development of the Fuelcell Stack

Casio's fuelcell stack, which creates electricity from hydrogen (photo 1, left), has a laminated structure of twenty power-generating cells consisting of separators and membrane electrode assemblies (MEA).

The high-density component

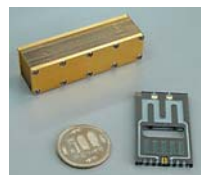


Photo 1  
Left: Fuelcell stack  
Right: Micro reformer

mounting is based on Casio's core competencies in water-resistance and durability. The company has also integrated technologies that optimize gas flow channels for the characteristics of the hydrogen produced by the micro reformer, and that improve MEA resistance to carbon monoxide. The result is 19.4 watts of rated output in a cell stack with a volume of only 22 milliliters (65H x 18W x 19Dmm). The rated power output per unit volume (power density per unit volume) has reached 882W/ℓ,\* the highest in the world among cells for use in mobile devices.

\*W/ℓ: A unit for measuring electrical output (watts) per one liter of volume, used as an index for miniaturization.

## Practical Applications for Micro High-Output Fuel Cells

Casio has combined its micro reformer module and its newly developed fuelcell stack to create a compact, high-power fuel cell for mobile devices. Casio's fuel cell (including the methanol cartridge) (photo 2, right) can power a notebook PC for about four times longer than a conventional lithium-ion battery of the same volume.

Casio is now working on the necessary peripheral parts and circuits, and plans to start delivering samples for performance evaluation by fiscal 2008. Casio is well on its way to creating yet another successful new business.



Photo 2  
Left: Conventional battery  
Right: Methanol cartridge (PET bottle)

### Key Person

## “The Solution Was Right in Front of Us”—Meeting Latent Universal Needs



**Masaharu Shioya**  
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Batteries are a wonderful technology with a history of over 100 years, but they do have shortcomings. Many people find it annoying to separate spent household batteries from the rest of the trash, as is required in many developed countries. It seems we have gotten used to this, however, so we keep using conventional batteries in our mobile electronic devices.

After giving this issue some thought in 1998, I decided to look into up-and-coming battery technologies. Worldwide concern over the environment was reaching new heights at the time, and it was clear to me that the time had come to question the common assumptions about the manufacture and sales of mobile electronic devices. I searched for ways to resolve the problem, going back to the basic principles of physics and chemistry, and reconsidering all of them.

The technology that I finally decided to pursue was fuel cells. Tiny, easily disposable PET containers (photo 2, right) are filled with methanol or another fuel, and the fuel is used to generate electricity to run a mobile electronic device. The empty plastic containers can then be recycled along with other plastic materials.

A necessity that people everywhere take for granted becomes a universal need. Casio creates products that meet these needs and make a real contribution to society. We will continue to develop technologies and deliver practical applications that help people achieve the goal of living in harmony with the environment.