

MOTECH
environmental
sustainability report
2011 ○

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MOTECH's Commitment to a Sustainable Environment

At MOTECH, we believe that sustaining our Mother Earth for future generations is the right thing to do. Helping in building a cleaner, greener world based on renewable energy sources is even more important, as we are committed to utilizing modern solar technology to create a more sustainable world.

A cleaner, greener world means not just bringing renewable energy sources to all corners of the world but also making the effort to refine the manufacturing process and striving to bring more environmentally friendly products to the world. We know that the silicon solar cell manufacturing process can have a detrimental impact on our environment and we learned more about this through the carbon footprint verification process. This report summarizes our findings concerning the carbon footprint of our main product, the IM156 multicrystalline solar cell and also serves as a reference by which future improvements can be measured. We will continue to improve the carbon footprint through refinement of our processes and will continue to look for ways to improve our manufacturing

processes so that we can ensure that we bring greener solar products to our world.

Since climate change is one of the major concerns of the 21st century, we have adopted greenhouse gas (GHG) emissions (quantified by carbon dioxide equivalent – CO₂e) as the primary measurement of environmental impacts on global warming.

Being vertically integrated through the silicon solar cell manufacturing supply chains, MOTECH is able to carefully examine every stage of the PV product life cycle, from raw material extraction, purification, ingot casting, wafer slicing, cell fabrication, and even module assembly, system installation, product utilization, and finally end-of-life treatment in the future. We use Life Cycle Assessment (LCA) as a tool to compare the environmental impacts of different manufacturing processes and identify areas in which we can make improvements so that we can continue to reduce our effect on the environment.



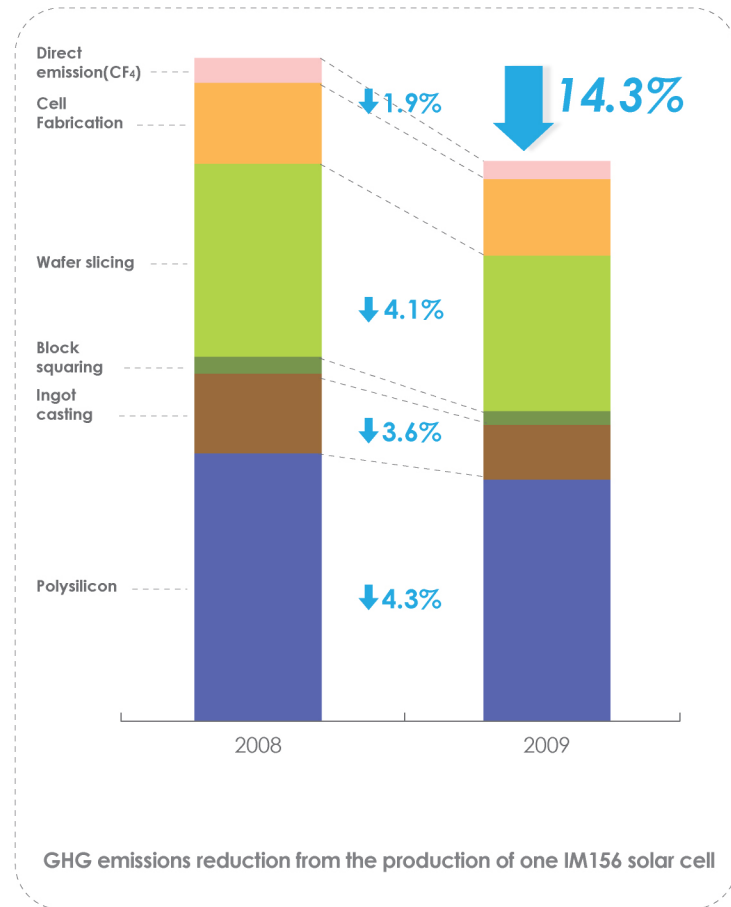
Polysilicon —●— Ingot —●— Block —●— Wafer —●— Cell —●— Module —●— Systems

MOTECH's fully integrated PV supply chain

Achievements for a Greener World 2008-2009

In order to create internal awareness and drive the reduction of environmental impacts from our manufacturing activities, we have established a database to monitor and evaluate potential impacts from our production process. By using the information in our database, we have already determined that the primary sources of GHG emissions come from the production of polysilicon (40%) and wafer slicing operations (30%); accounting for approximately 70% of the total emissions.

We have implemented numerous actions to reduce our impact on the environment, such as: recycling materials, streamlining the manufacturing processes, and optimizing material and energy use. Our efforts have resulted in reducing GHG emissions by **14.3%**, primarily by reducing our polysilicon consumption reduction, innovative improvements in our wafer slicing operations and ingot casting process modification. The direct GHG emitted from MOTECH manufacturing process is **CF₄**, which was reduced by **1.9%** as a result of less polysilicon consumed in the new process recipe.



Achievements for a Greener World 2008-2009

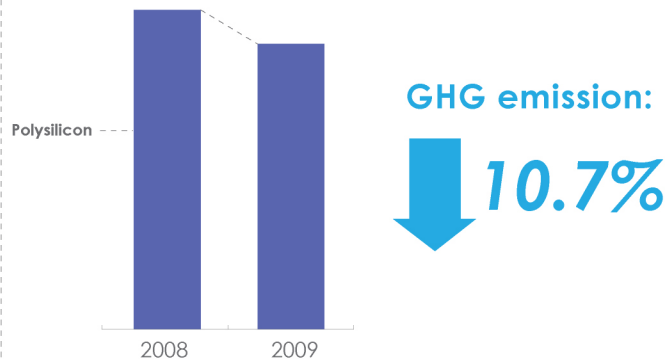
Ingot Casting

Jumbo sized ingots reduce consumption of polysilicon and energy

In the ingot casting process, the majority of GHG emissions are associated with the production of polysilicon, and the electricity needed during the process. In 2009, MOTECH successfully switched to casting jumbo sized ingots which are more than 1.5 times the size of conventional ingots and gained 28% more yield. These jumbo sized ingots resulted in a reduction of GHG emissions of **10.7%**. Combined with lower material consumption and electricity usage on a kg-ingot basis, we reduced GHG emissions by **30.2%** during the ingot casting stage.

Polysilicon consumption

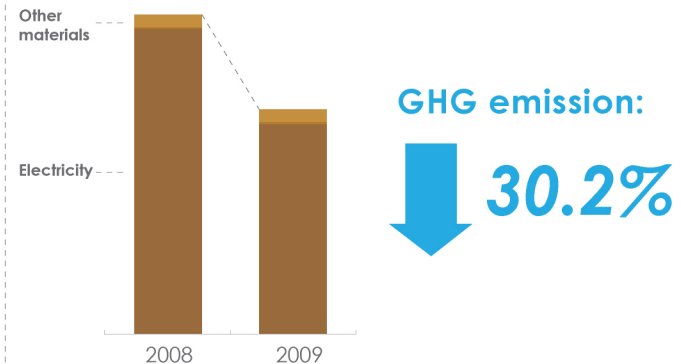
By effectively casting more ingots simultaneously, 10.7% less polysilicon is required to produce one standard solar cell.



GHG emissions reduction from polysilicon consumption

Ingot casting

28.5% less electricity is consumed per kilogram of the ingot casted.



GHG emissions reduction from ingot casting

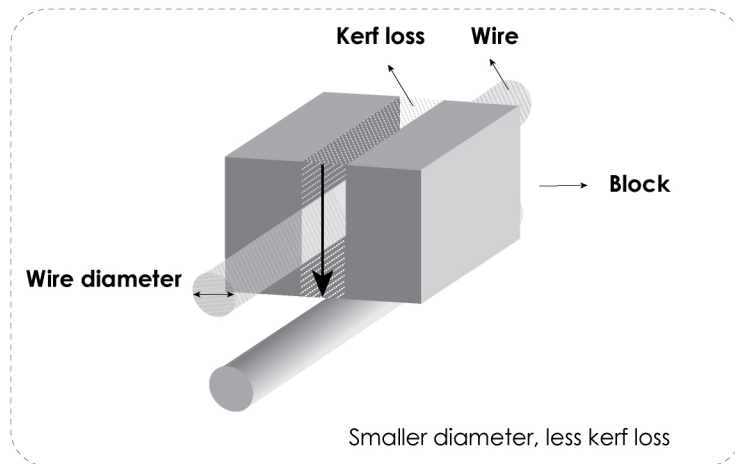
Achievements for a Greener World 2008-2009

Block squaring and wafer slicing

The largest contributor of GHGs in the solar cell life cycle is from block squaring and wafer slicing, and therefore MOTECH has adopted a thinner wire and begun recycling of slurry to improve GHG emissions. As a result, GHG emissions associated with block squaring and wafer slicing have been decreased by 13.2% on a per wafer basis.

Thinner wire reduces kerf loss

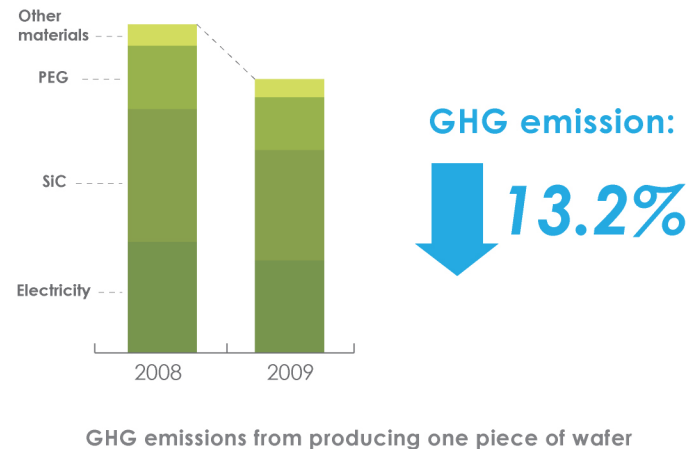
A silicon ingot is partitioned into blocks and then sliced into very thin wafers; this process typically results in a significant amount of ingot loss (commonly referred to as "kerf loss"). To minimize this issue, MOTECH uses thinner wires which have resulted in reducing the kerf loss and increasing wafer yields by at least 11.2% per ingot.



Block squaring and wafer slicing

Block squaring and wafer slicing

Consumptions cut in SiC, PEG, and electricity, respectively of 23.4%, 6.7% and 7.8% contribute to a 13.2% GHG emission reduction per wafer.



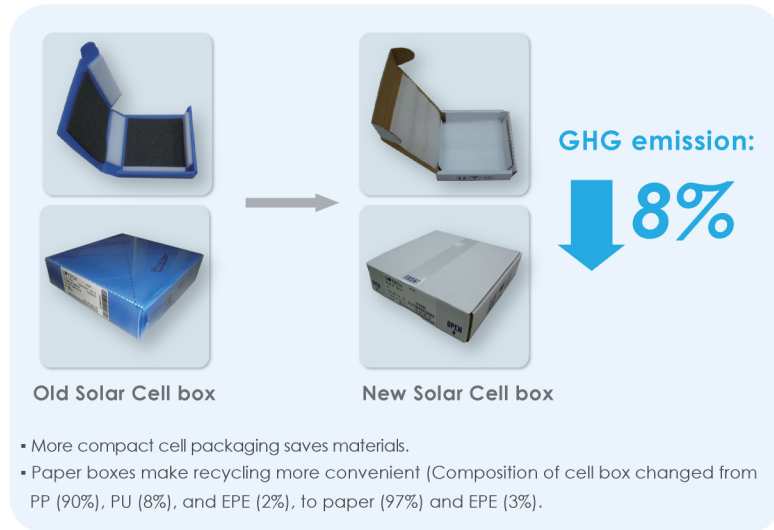
Slurry recycling reduces materials consumption

In 2008, the recycling of slurry reduced our consumption of SiC and PEG on a per wafer basis by 23.4% and 6.7%, respectively. Although the process of recycling slurry requires more energy, we have managed to achieve a net 7.8% reduction in overall electricity consumption, due to our efforts in enhancing wafer yield.

Achievements for a Greener World 2009-2010

Improvements in packing materials

The new packaging is more fitted to the product, ensuring less product movement and breakage during transport. In addition, the packaging material is now composed of paper and EPE, which makes recycling easier for users. These efforts have reduced our GHG emissions by 8%.

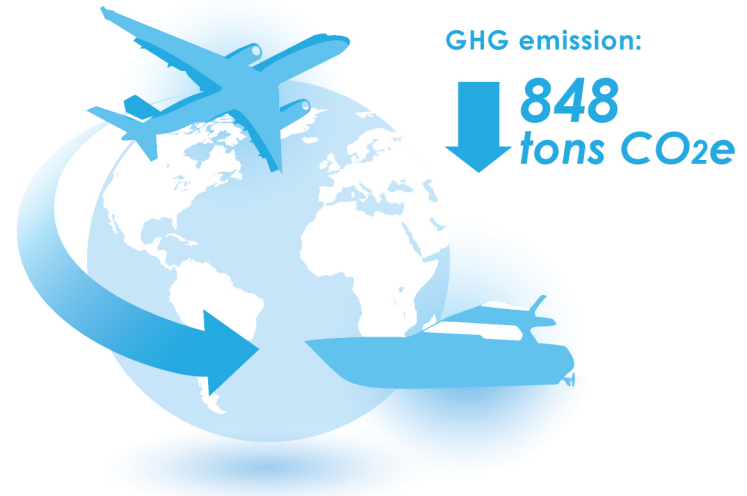


The diagram shows a transition from an old, larger blue solar cell box to a new, more compact white solar cell box. An arrow points from the old box to the new box, with a large blue arrow pointing down to the text 'GHG emission: 8%'. Below the boxes are the labels 'Old Solar Cell box' and 'New Solar Cell box'.

- More compact cell packaging saves materials.
- Paper boxes make recycling more convenient (Composition of cell box changed from PP (90%), PU (8%), and EPE (2%), to paper (97%) and EPE (3%).)

Transportation by sea

Air transportation is common in the PV industry for prompt delivery, especially when materials shortages occur. However, shipping by air requires more fuel and results in high GHG emissions; about 49 times more than shipping by sea. In 2009, at our request, our vendors shipped 287 tons of polysilicon by sea to MOTECH, resulting in a reduction of 848 tons of CO₂e. We will continue to increase the proportion of materials transported by sea with well planned schedules, thereby reducing GHG emissions while ensuring that our customers receive their products in a timely manner.



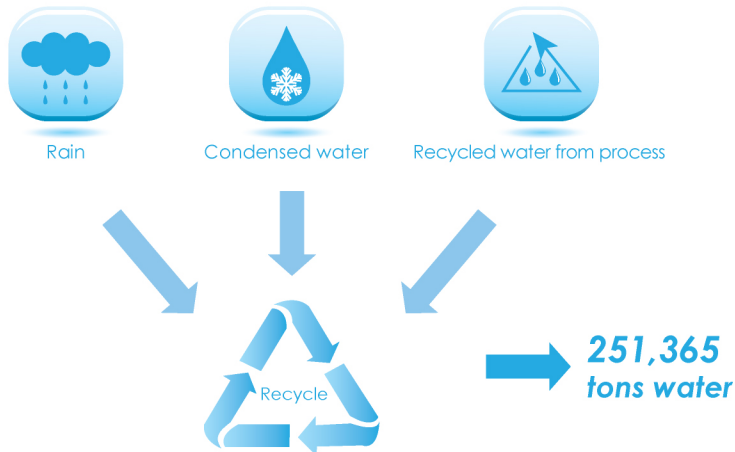
The illustration features a globe with a blue airplane flying over it and a blue cargo ship sailing below. A large blue arrow points down from the text 'GHG emission: 848 tons CO₂e'.

Achievements for a Greener World 2009-2010

Water recycling and reuse

Water is one of the most precious resources in the world. Because of global climate change and explosive population growth, water conservation has become an important issue.

As a leader in the PV industry with solid production capacity, MOTECH understands the importance of water conservation and uses tap water, rain water and condensed water as reusable resources. Furthermore, MOTECH also makes an effort to educate their employees to save water in their daily lives. We recycled 251,365 tons of water in 2009 and consumed 20% less water while expanding cell production in 2009.



Ongoing Improvements (2010 ~)

In addition to internal improvements in our manufacturing processes, we are working with our vendors to find ways to reduce GHG emission.

Polysilicon production by FBR technology

AE Polysilicon (AEP), an affiliate of MOTECH has adapted their advanced Fluidized Bed Reactor (FBR) technology to create high quality solar-class polysilicon. In contrast to the Siemens' process, the most commonly used polysilicon processing technique, AEP's FBR process has environmentally friendly advantages: 1) no Silane (SiH_4) is used, instead, TriChloroSilane (TCS) which requires significantly less energy consumption; 2) the (FBR) process is a continuous process; therefore, the overall amount of energy to produce an equal amount of polysilicon is less than other polysilicon processing techniques.



AE Polysilicon (AEP)



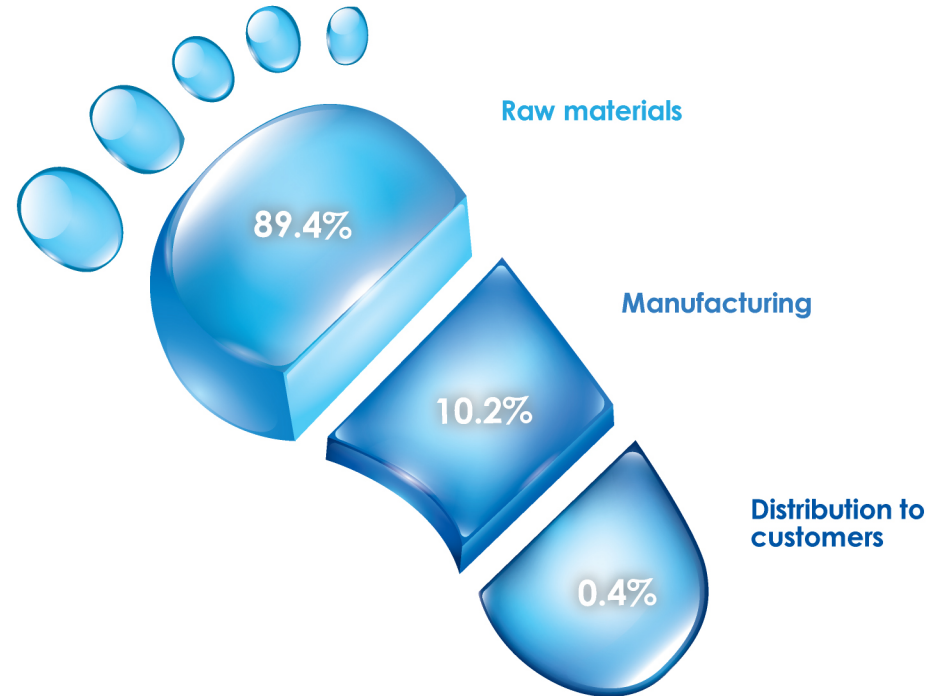
Polysilicon from FBR process

World First Carbon Footprint Verification on a Silicon Solar Cell

In August 2010, MOTECH IM156 cell was verified by SGS as the world's first multicrystalline solar cell to gain PAS 2050:2008 Carbon Footprint Verification.

The carbon footprint of a product refers to its associated GHG emissions, quantified by carbon dioxide equivalent, throughout its life cycle. By tracing the carbon footprint of the IM156 cell, MOTECH verified that raw materials accounted for **89.4%** of total carbon emissions, manufacturing **10.2%** and distribution **0.4%**.

Carbon footprint verification serves as a basis for MOTECH to understand the impact of each of our manufacturing phases on the environment. Furthermore, we will share this carbon footprint with our customers in order to assist the process of creating a more sustainable environment for future generations.



Carbon footprint of IM156 solar cell

Relentless Efforts toward a Sustainable World



MOTECH, MOve the Future

As a leading company in the global PV industry, MOTECH strives to provide clean and sustainable solar energy and to set an example of dedication to a green manufacturing environment with this “MOTECH Environmental Sustainability Report 2011”.

We will continue to reduce the carbon footprint we make in the production of not only PV solar cells, but also in the production of modules, inverters, and systems as we pursue our mission to reduce environmental impacts. Furthermore, in Jan. 2011 MOTECH joined the PV Cycle organization, which handles module recycling after end-of-product-life, and demonstrated an ambition to be more clean and more green. MOTECH endeavors to provide eco-friendly PV products with performance and quality for a sustainable world.

MOTECH Sustainability Committee

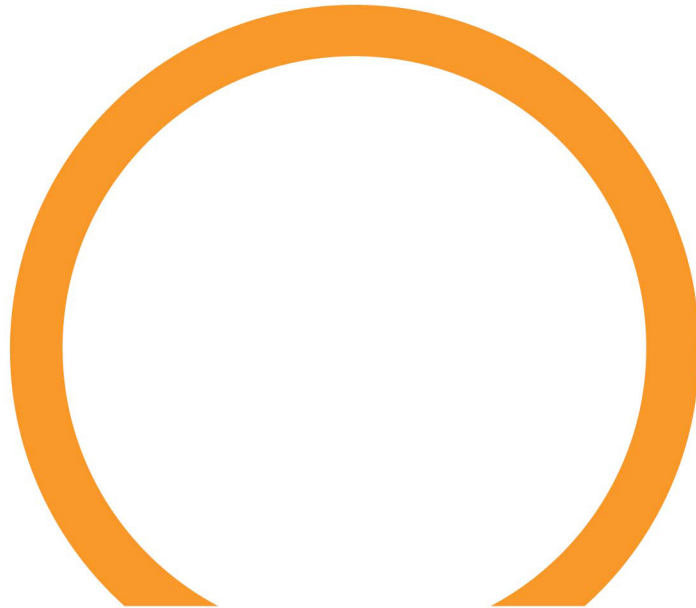
Each department at MOTECH takes responsibility

MOTECH has been advocating the use of solar energy since 2000 and has faith that it is one of the most effective forms of renewable energy for building a greener and cleaner environment. Every department in MOTECH has taken responsibility for developing strategies and actions to enable a sustainable environment.



- The report issued by : **MOTECH Sustainability Committee**

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Modern Technology for a Sustainable World

