Motech environmental sustainability report 2010

Motech environmental sustainability report 2010

Motech's Commitment to Sustainable Environment

At Motech, we believe that the effort to sustain our Mother Earth is not just the right thing to do, but the core value which we can pass down to future generations. This is why we stand by our commitment to utilize modern technology to create a more sustainable world.

We strive to make the world brighter by bringing power to every corner of the world. At the same time, we realize that the process of this endeavor has to be a socially recognized action. This means that all of our activities undertaken to achieve our goal has to match the expectation of the public. In this report, our intention is to convey the essence and progress of Motech's environmental responsibility.

Since climate change is considered to be one of the major concerns of 21st century, in this report, we adopt greenhouse gas (GHG) emissions (quantified by CO_2-equivalent) as a primary measurement of environmental impact. Other impacts such as resource consumption and the use of toxic substances are also among our major concerns.

Motech is a photovoltaic (PV) product provider with vertically integrated supply chains; therefore we carefully examine every stage of the PV product life cycle, from raw material extraction, purification, ingot casting, wafer slicing, cell fabrication, to module assembly, system installation, utilization, and finally the end-of-life treatment. We use Life Cycle Assessment (LCA) as a tool to prioritize items throughout the complete manufacturing process from polysilicon to solar cell systems, and to measure our achievements with the reduction of environmental impacts.

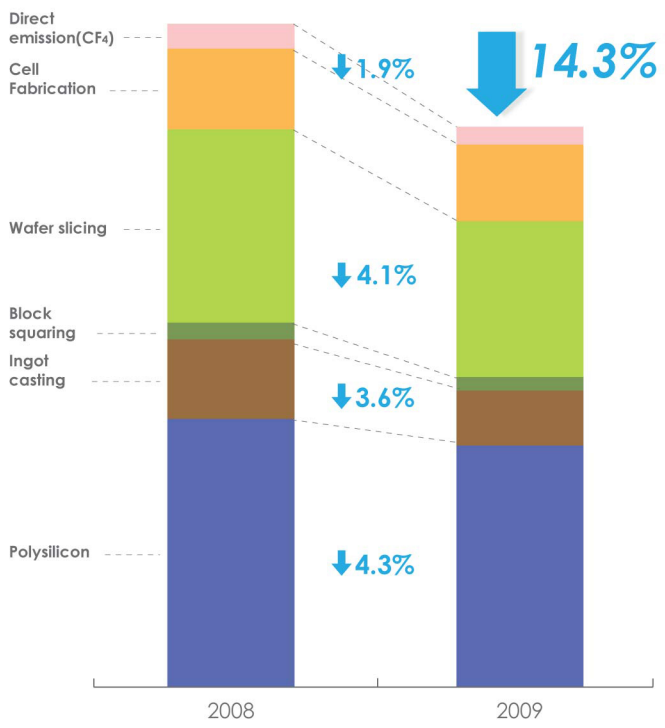
Motech's vertically integrated PV value chain

Achievement for Sustainable Environment 2008-2009

To reduce the environmental impacts associated with manufacturing activities, we have established our own environmental database to monitor and evaluate the impacts of our production processes. The GHG emissions are mainly from polysilicon (40%) and wafer slicing (30%), accounting for around 70% of the total emissions.

We have also implemented numerous actions to reduce impacts to our environment, such as the recycling of materials, streamlining of process, as well as optimization of material and energy utilization. We have achieved a **14.3%** reduction in GHG emissions associated with the production of one solar cell in 2009 compared with 2008. Among these statistics, reduction of **polysilicon** consumption, improvements in **wafer slicing**, and modification of **ingot casting** process are major achievements, the result is emission reduction of **4.3%**, **4.1%** and **3.6%**, respectively. The sole direct GHG emission from Motech is the release of **CF_4** after dry etching in cell fabrication. A 1.9% GHG emission reduction was achieved by reduction of CF_4 emission.

In the following sections, we will elaborate on the respective actions undertaken by Motech; follow by description of ongoing efforts and outlooks of reducing environmental impacts. Finally, we will describe how Motech has institutionalized the concept of sustainability, and restless efforts to cooperate with vendors and customers for a better and cleaner future.



GHG emissions of producing one piece of IM156 solar cell

Ingot Casting

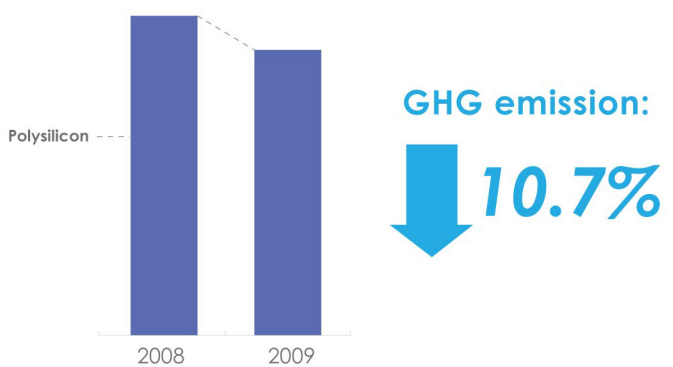
Jumbo size ingot reduces polysilicon and energy consumption

In the ingot casting process, most of the GHG emissions is associated with polysilicon consumption, followed by electricity usage. In 2009, Motech changed to jumbo size ingots, more than 150% of the conventional size. Compared to the previous usage of polysilicon, we now only use 89.3% for cell production, resulting in an impressive **10.7%** reduction of emissions.

By changing to jumbo size ingot, the improved process yields 28.0% extra ingot, which results in 28.5% less electricity usage on a kg-ingot basis. Together with reductions of other materials used, jumbo size ingot reduced **30.2%** of GHG emissions during ingot casting process.

Polysilicon consumption

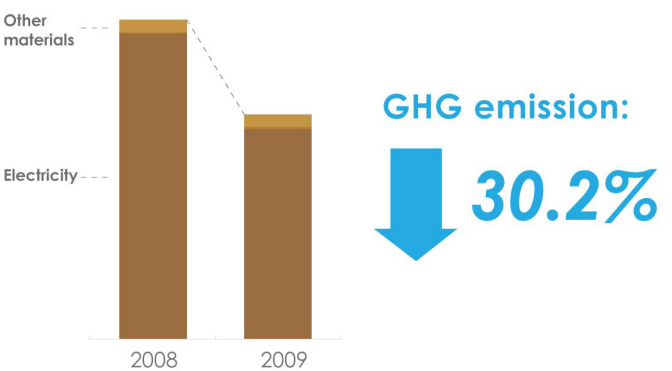
While casting more ingots at one time, **10.7%** polysilicon is saved



GHG emissions reduction of polysilicon consumption

Ingot casting

Electricity consumed is **28.5%** lower for casting one kilogram ingot.



GHG emissions reduction of ingot casting

Block squaring and wafer slicing

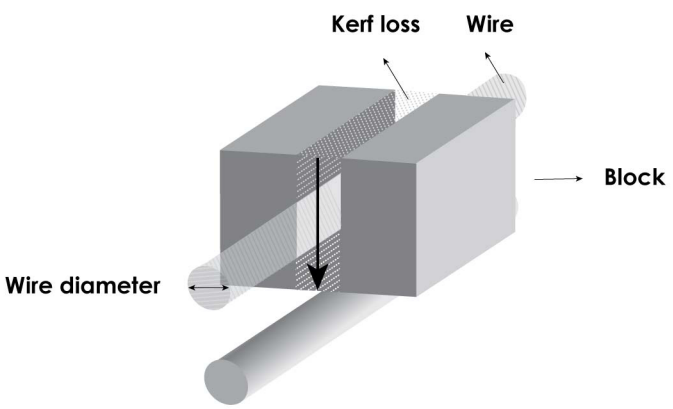
Since most GHG is emitted during wafer slicing, Motech adopts thinner wire and recycling slurry to reduce GHG emissions. As a result, GHG emissions associated with squaring and slicing decreased by **13.2%** on one wafer (2008) basis.

Thinner wire reduces kerf loss

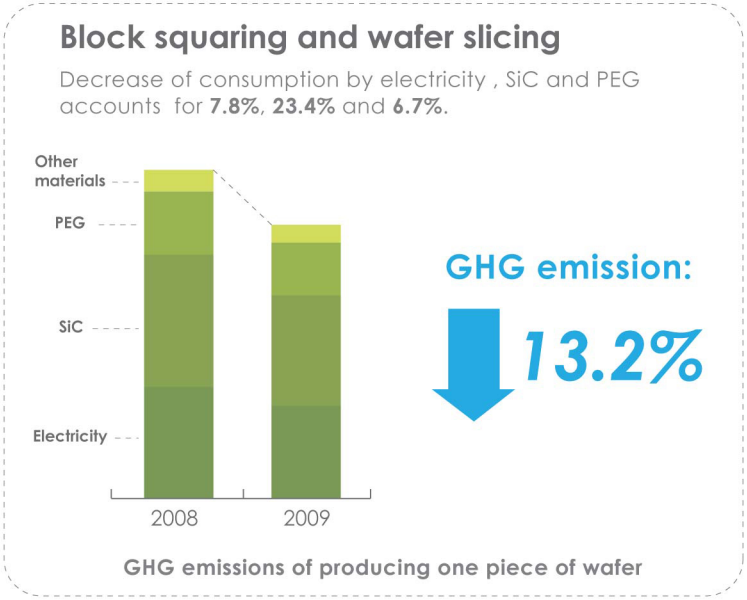
Silicon ingot is partitioned into blocks at the first stage, and then sliced into very thin wafers. Losses in the process (kerf loss) is around half of the ingot. To reduce kerf loss, Motech now uses thinner steel wire to produce 11.2% more wafers from a given ingot.

Slurry recycling reduces material consumption

On one wafer (2008) basis, 23.4% of SiC and 6.7% of PEG consumption are reduced by slurry recycling. Although slurry recycling uses more electricity, we still observe a net 7.8% reduction in electricity consumption as a result of enhanced wafer yield from standard to jumbo size ingot.



Smaller diameter, less kerf loss



Ongoing Improvement Projects

Apart from the improvements made during cell fabrication, Motech is further working with our vendor in developing advanced technologies, water recycling, improved packaging materials and utilization of sea transport instead of air.

Polysilicon by FBR technology

AE Polysilicon (AEP) utilizes advanced Fluidized Bed Reactor (FBR) technology - a fully integrated closed-loop process to produce solar-grade polysilicon. In contrast to Siemens process, the most common technology worldwide, AEP's process 1) uses TriChloroSilane (TCS) instead of silane, which makes its energy consumption significantly lower, and 2) has much enhanced throughput by realizing a continuous process.

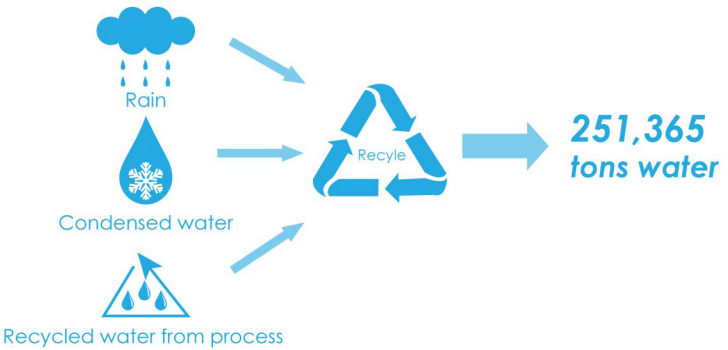
AE Polysilicon (AEP)

Polysilicon from FBR process

Water recycling and reuse

Water is one of the most valuable global resources. Because of the global climate change and explosive population growth, water distribution and usage have become important issues.

As a leader in PV industry, Motech emphasizes the importance of water recycling and reuse. The main sources for Motech are : tap water, rain and condensed water. Besides recycling water in the manufacturing process, Motech has also educated its employees to reduce water usage. Although cell production in 2009 is greater than it was in 2008, the water consumption of 2009 is 20% lower than it was in 2008. The achievement of water recycling was **251,365 tons** in 2009, which is 52% higher than the 2008 figure.

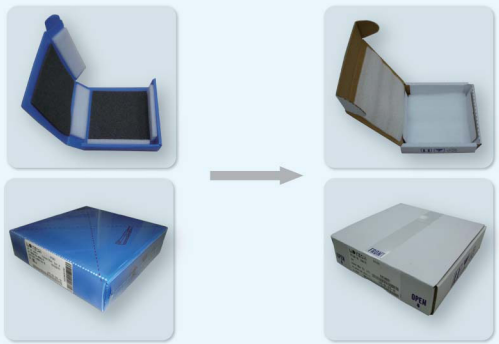


Ongoing Improvement Projects

The improvement in packaging materials

To reduce our environmental impacts, we sought packaging materials that are readily recyclable. On the other hand, reducing breakage rate during the shipping is also our concern as it is crucial for achieving lower per-product impact.

Our new packaging material uses paper and EPE only so that our customers can recycle the package with fewer issues. Compared to the old packaging material, **8%** of GHG emissions have now been reduced since we changed to the new material.



Old Solar Cell box

New Solar Cell box

GHG emission:

8%

- More compacted box reduces consumption of packaging materials (box, carton and pallet)
- Simpler box composition makes recycling easier
  (Composition of cell box changes from PP (90%), PU (8%), EPE (2%) to paper (97%), EPE (3%).

Use of sea transportation

PV industry has encountered material shortages since 2004. To shorten the delivery time, air transportation has been very common. Shipping by air comes with more fuel usage; GHG emissions are about 49 times more by air than by sea. In 2009, we shipped 287 tons of polysilicon by sea, with a reduction of **848 tons** of CO_2e. We will keep increasing the proportion of sea transportation with well planned schedule to reduce the GHG emissions during transportation.

GHG emission:

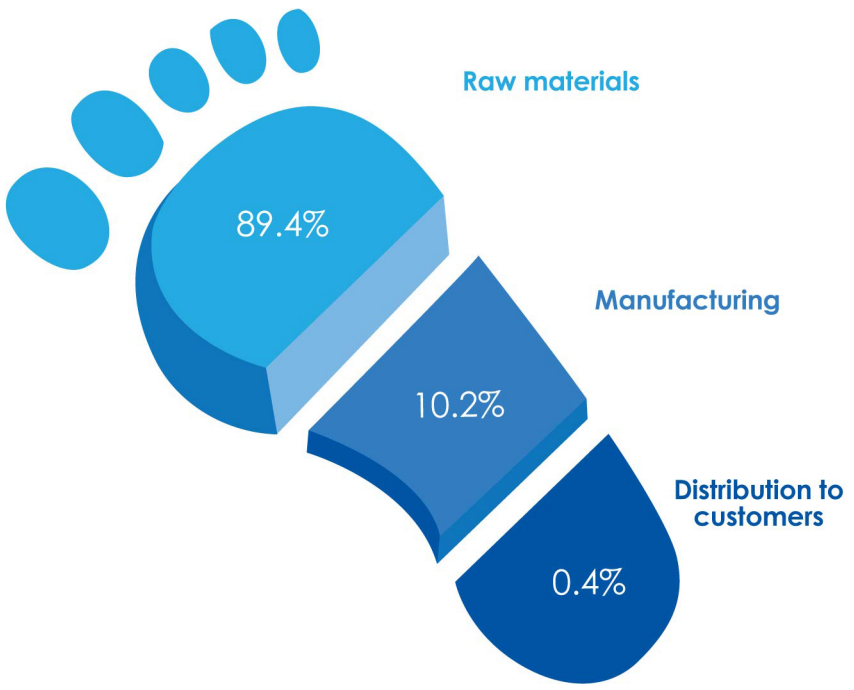
848 tons CO_2e

World's First Carbon Footprint Certificated Solar Cell

In August 2010, Motech IM156 cell was certified by SGS as the world's first poly-crystalline solar cell to gain PAS 2050:2008 Carbon Footprint Verification.

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

Carbon footprint verification serves as a basis for Motech to understand the impacts on the environment caused by every activity in all of the manufacturing phases. Furthermore, we share the emissions inventories and jointly develop approaches with our customers in order to create a sustainable environment for the benefit of all human beings.

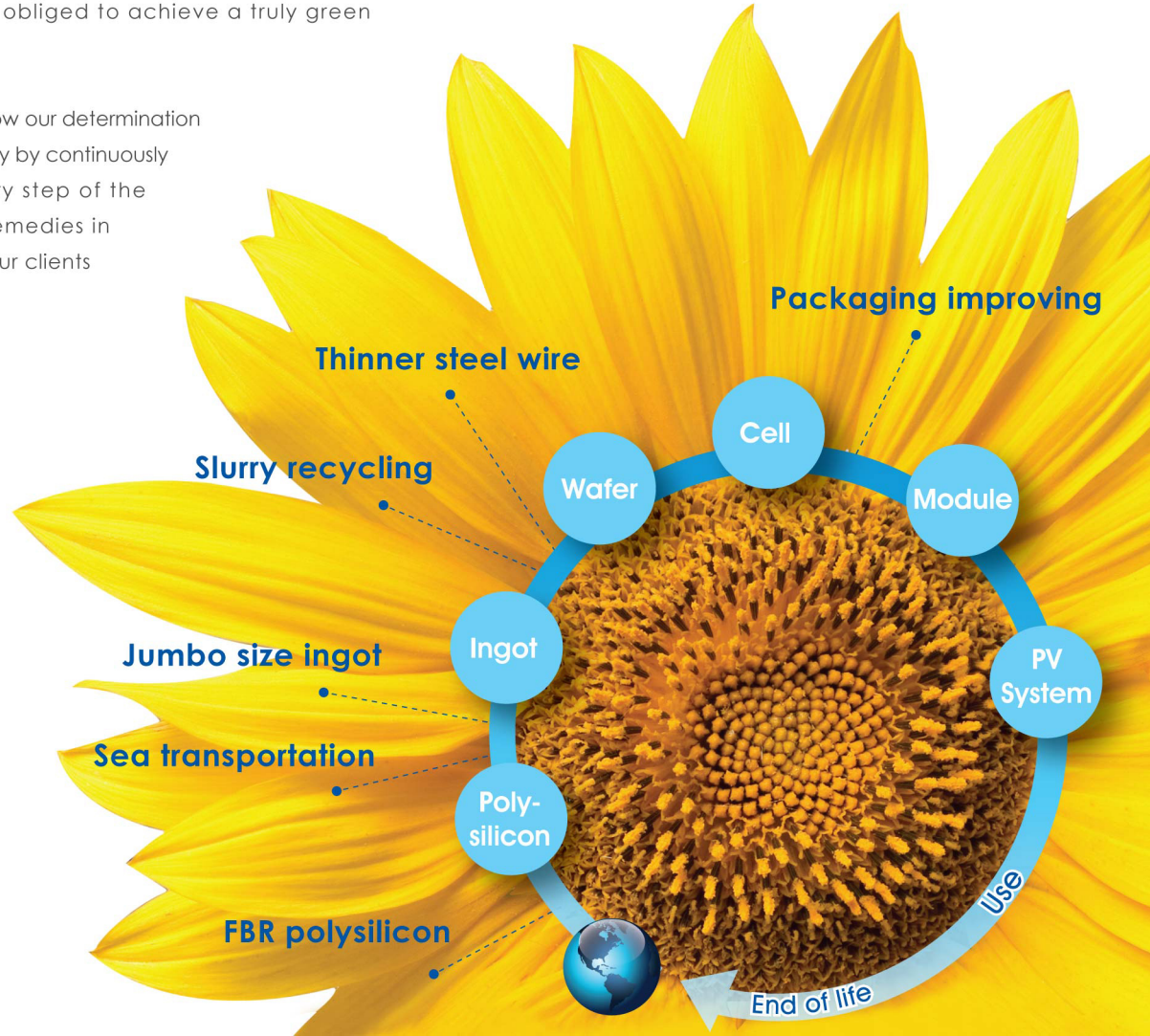


Carbon footprint of IM156 solar cell

Restless Efforts toward Sustainable World

Being a leader in solar PV industry, Motech not only endeavors to provide clean and sustainable energy converted from sunlight, but also feels obliged to achieve a truly green manufacturing process.

Benefiting from our vertically integrated stand, we show our determination to create a sustainable world with modern technology by continuously evaluating the environmental impacts in every step of the **PV Life Cycle** and then providing efficacious remedies in the shortest time. We are confident of providing our clients with the most eco-friendly solar cells.

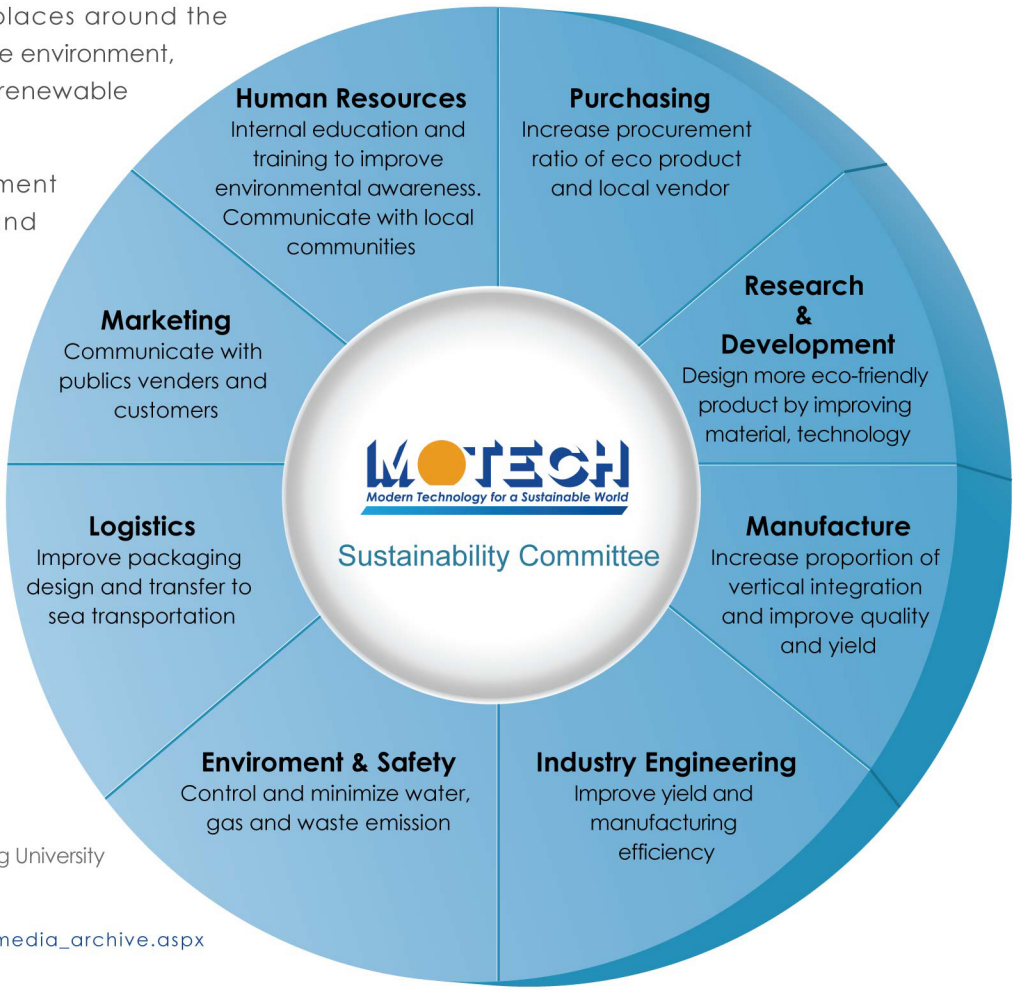


Motech Sustainability Committee

Each department is dedicated to achieve the goal of sustainability

Motech has been delivering solar energy to many places around the world since 2000. In order to build a green and sustainable environment, we believe that solar energy is one the most effective renewable energy to help achieving the goal.

In Motech's Sustainability Committee, every department in Motech is dedicated to developing strategies and solutions for building a sustainable environment.



- **The report issued by :** Motech Sustainability Committee
- **Editorial supervisor :** Prof. Yasuhiro Fukushima, National Cheng Kung University

To learn more, please view http://www.motech.com.tw/news/media_archive.aspx
or contact us at sustainability@motech.com.tw


Modern Technology for a Sustainable World