新菱
Shinryo

Shinryo PV Panel Recycling

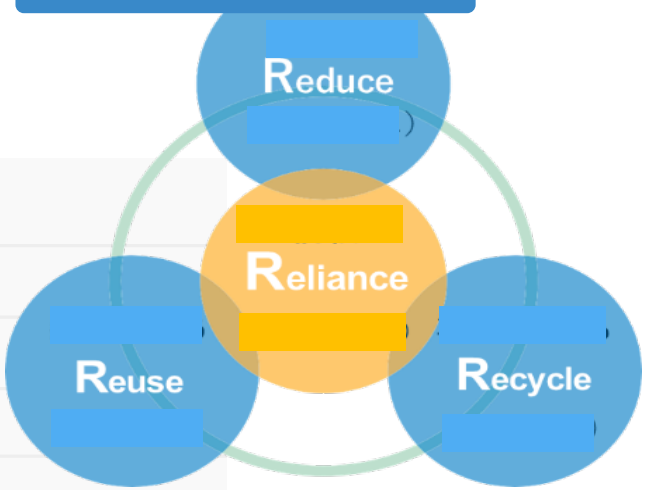
2024.01
Shinryo Corporation

Shinryo Corporation Introduction

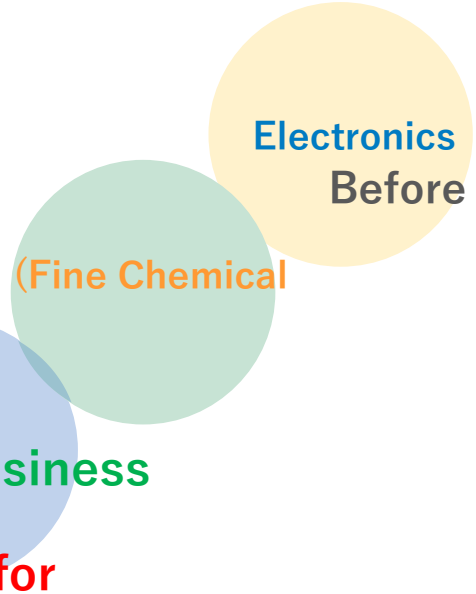
Company name	Shinryo Corporation
Head Office	Kitakyushu city, Fukuoka
President	Masaaki Tsuchiyama
Establish	1964
Capital	500 million yen
Stockholder	Mitsubishi Chemical Corporation, 100%
Sales	27,200 million yen (Fiscal Year 2022)
Employees	ca. 1,300 employees(2023.)

Corporate Philosophy

4Rs realization



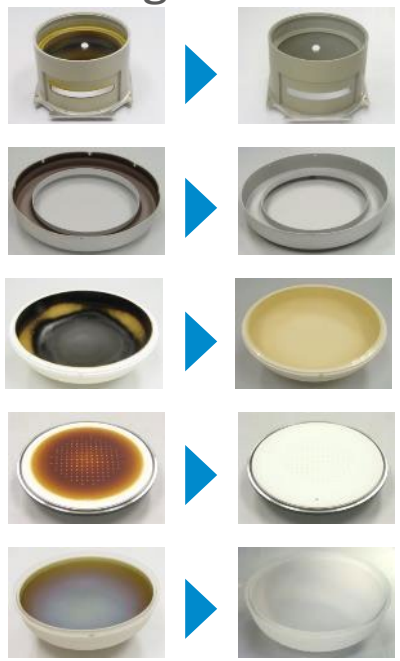
Business Activities



Wafer Reclaiming

Precision cleaning of semiconductor components

Before cleaning → After cleaning



Circular Economy Business

Recycling business for

Waste liquid,

Fine ceramics,

Office automation equipment,

Carbon fiber, and PV panel

Overview of Recycle Tech Corporation

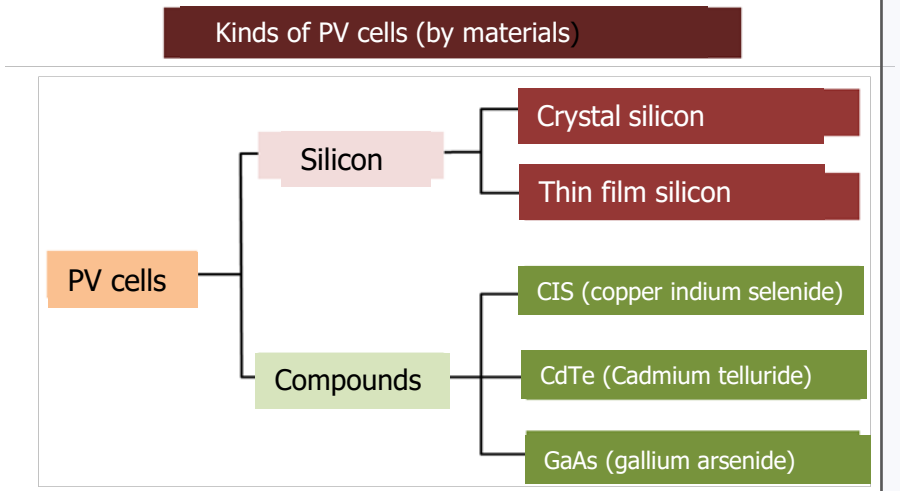
Shinryo Corporation is outsourcing the PV panel recycling operation to Recycle Tech Corporation, a group company of Shinryo.

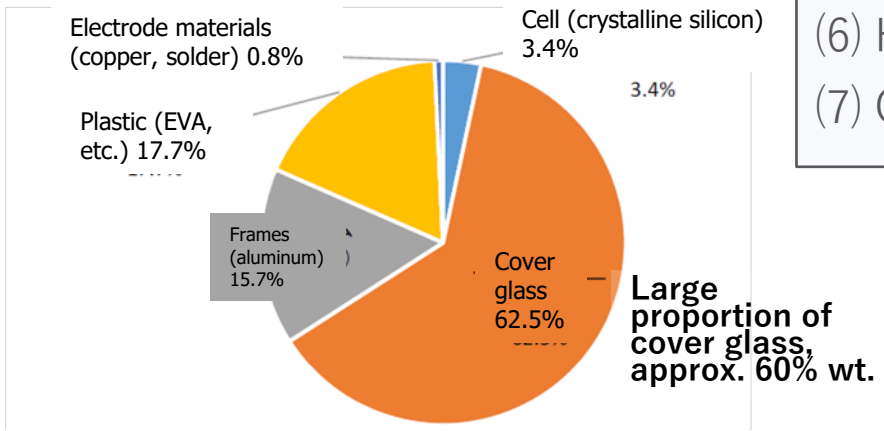
Paid-in capital	30million yen
Capital contribution	Shinryo 81% ・ Ricoh19%
Start of operations	April 1994 (Established to recycle used office automation equipment and resources of Ricoh Company)

◆Ministry of Economy, Trade and Industry Eco-Town Subsidized Project
ISO 14001 certification (March 2001)
◆The first eco-town in Japan July 1997
ISO 9001 certification (December 2006)

Recycling Process for the PV panel : Issues/Background

- Most of the waste PV panels are disposed in the landfill currently.
- PV panels from different companies are made from different materials.





Large proportion of cover glass, approx. 60% wt.

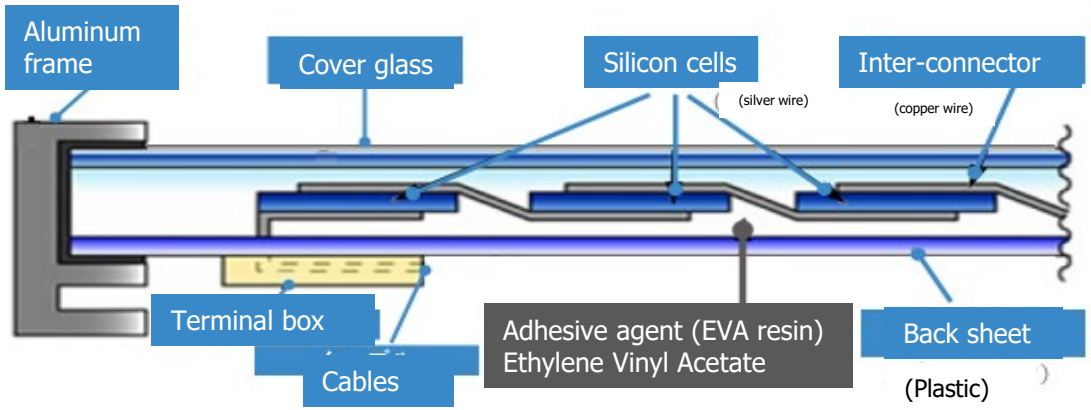
(1) The arrival of the age of mass disposal
(2) Demand as a social system
(3) Low cost▶ Business profitability
(4) Stable quality ▶ Business continuity
(4) Versatility: Compatible with various types of PV panels (crystalline Si, thin-film Si, CIS)
(5) High recycling rate
(6) High recycling rate ▶ Recyclability
(7) Compatible with Circular Economy

It is necessary to establish low cost and versatile recycling method of the PV panel to realize the circular economy society.

Source; NEDO (2009) Research on Life Cycle Assessment of Photovoltaic Power Generation Systems

PV Panel Structure (Si crystalline system) and Issues

PV Panels Structure (Crystal silicon)



【The structure of PV Panel】
The PV panel consisted of some materials such as aluminum, glass, silicon (silver wire), copper wire, and plastics and are strongly bonded by EVA resin.

【Issues in PV panel recycling】
Sorting each material is necessary to recycle resources.
▶ Removal of adhesive (EVA resin) is challenging.

We developed the technology to remove EVA resin by heated gas

新 菱
Shinryo

The History of Developing PV panel Recycling Technology

[Ministry of Economy, Trade and Industry, NEDO projects]
Kitakyushu Foundation for the Advancement of Industry, Science and Technology (FAIS)

[Ministry of Environment, Demonstration projects]

[Ministry of Environment, Demonstration projects]

2010 | 15 | 20 | 23

EVA resin, pyrolysis removal method established (panels without broken glass)

Basic research/ technological development for recycling

Building demonstration plants
Reliability/safety evaluation

Social implementation

Recycle plant construction

Commer-cialization

Technological development to deal with broken glass

PV Panels Structure (Crystal silicon)

Common fortune development for CFR

Advanced sorting technology, Waseda University, Prof.Owada

[Ministry of Environment, FAIS]

[Fukuoka Research Commercialization Center for Recycling Systems]

Establishment of a collection system for waste PV panels

Establishment of the PV panel recycling and collection business model

Establishment of the smart collection system
PV Maintenance and Recycle Promotion Society
Photovoltaics After Maintenance Society

LCA Kitakyushu Municipal University Prof. Matsumoto

We would like to thank all for their guidance and support.

Our Advanced PV Panel Recycling Plant

Ministry of Environment FY2021 Subsidy for Carbon Dioxide Emission Reduction Project (Project to Promote the Introduction of Advanced Resource Recycling Facilities for the Establishment of a Decarbonized Society)

Processing capacity: 90,000panels/year(estimate) (1,440 tons/year)

Very simple pretreatment : we only need to cut a cable before inputting to the Pyrolysis furnace.

Mega Solar Plants

Module production factories

Residences

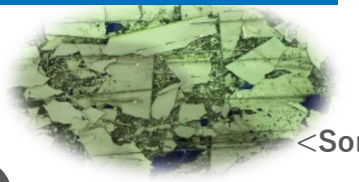
Thin film silicon

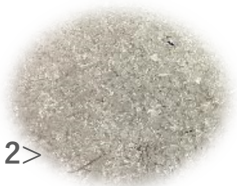
Crystal silicon

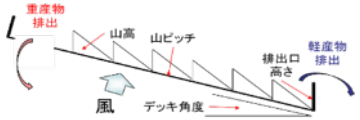
PV Panel Recycling Advanced Sorting Technology Development

*Sorting process: Joint research with Waseda University

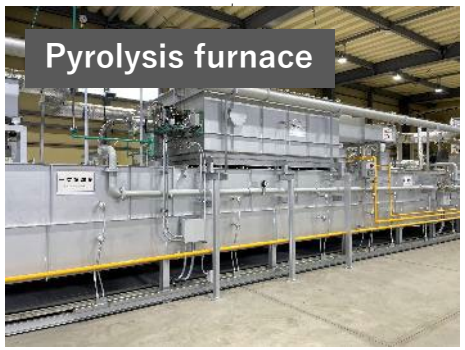
PV panels after firing







<Sorting 1 > <Sorting 2> <Sorting 3>



Pyrolysis furnace

Dry vibrator

Wind sorter

Air table

【collected valuables】

Copper wire [4.0%].

Cu：55.2%
Ag：8,539g/ t

Silicon cell [7.3%].

Cu：1.9%
Ag：5,683g/ t

Glass [86.5%]

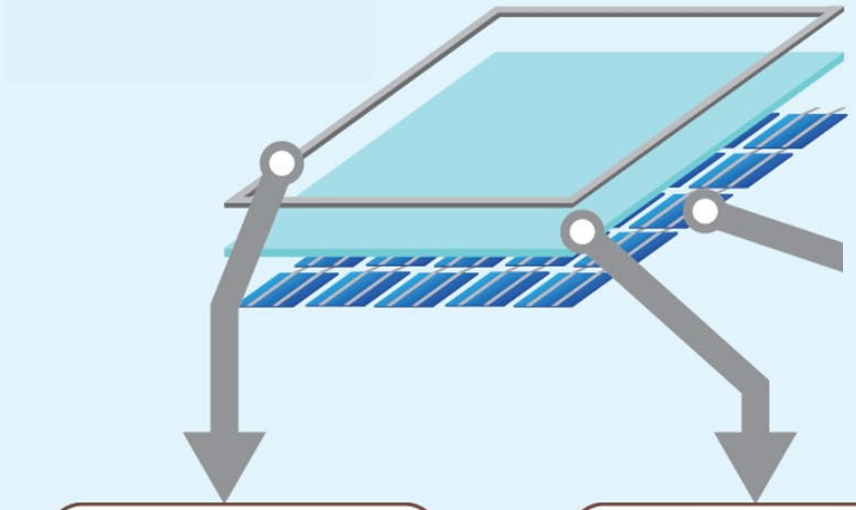
glass：99.999%

Silicon cells and others [2.2%]

Cu：15%
Ag：3,291g/ t

Resource Recycling at Advanced Recycling Plant

1MW (about 86 tons) discarded PV panels recycling



The total effect of CO2 reduction will be Approximately 200 tons.

(in comparison with landfill or roadbed materials) *Calculated based on 1MWequivalent,240w/panel

Cited materials
□apan Chemical Industry Association
□NEDO

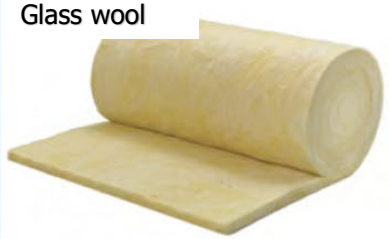
Aluminum frame

Aluminum

Resource recovery; about 13tons

Glass

Glass wool



Resource recovery; about 54tons

Cell, Cooper wire

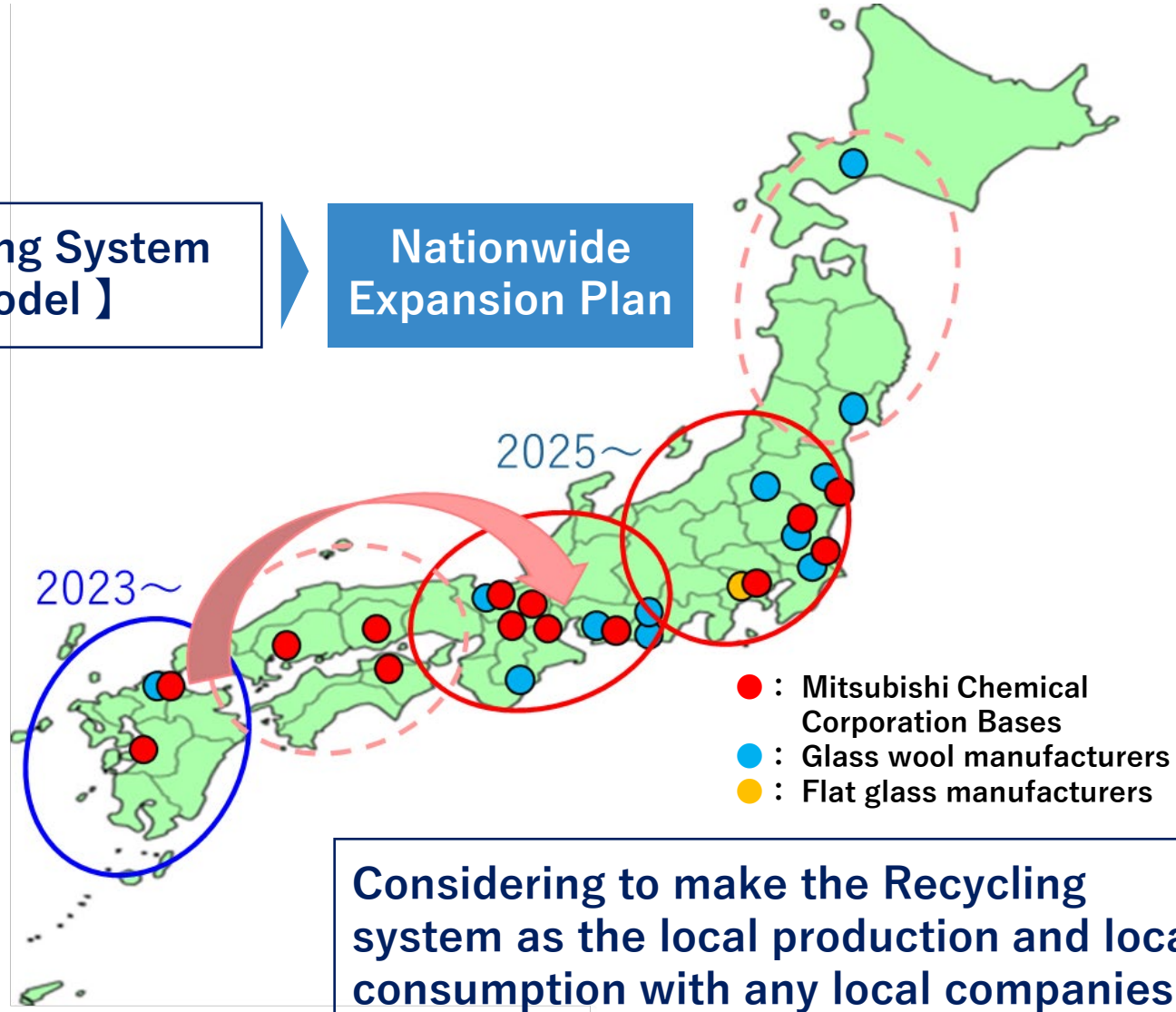
Silver, copper

Resource recovery; about 1ton

PV Panel Recycling Business: Nationwide Expansion Plan

Building the Recycling System
【 Kitakyushu Model 】

Nationwide Expansion Plan



Considering to make the Recycling system as the local production and local consumption with any local companies when discarding the PV panel also

新菱
Shinryo

End of Presentation