

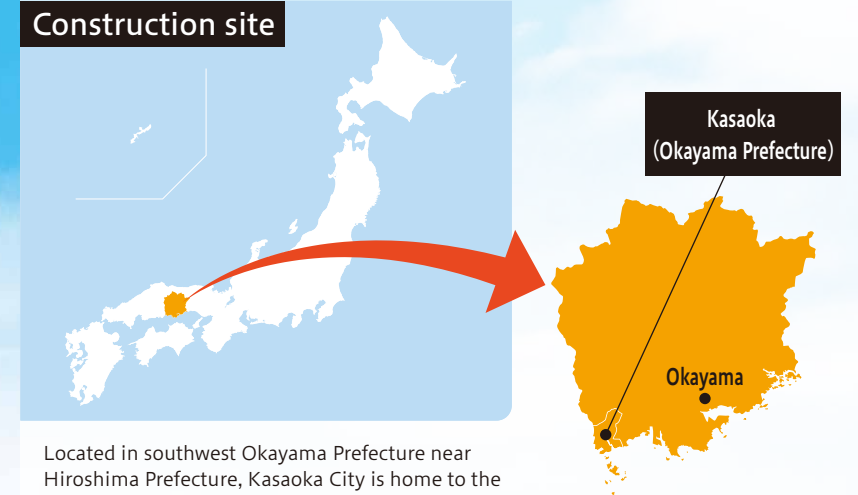
# Supporting innovation in agricultural technologies for a new era by making sustainable facility operation a reality

Energy Plant Business: Biomass Power Plant Construction/O&M Project in Kasaoka  
SARA Inc.

Related SDGs



## Construction site



Located in southwest Okayama Prefecture near Hiroshima Prefecture, Kasaoka City is home to the Kasaoka Bay Reclamation Site, one of four largest reclamation sites in Japan.

As a company dedicated to “Taking Agriculture in Asia into the Future,” plant customer SARA Inc. is dedicated to offering a stable supply of delicious vegetables that can be consumed with peace of mind throughout the year and to achieving reasonable, sustainable relationships with producers, sellers, and consumers. At an enormous reclamation site on Kasaoka Bay in Okayama Prefecture, SARA operates one of the world’s most advanced protected horticulture businesses that combines vegetable cultivation in a 13-hectare semi-enclosed greenhouse which is one of the largest structures of its kind in Japan and a biomass power plant. Here the company grows and ships safe, delicious, and fresh salad tomatoes, paprika, and leaf lettuce that can be enjoyed with peace of mind.



Facility overview

Greenhouse

Biomass power plant



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### The power of group collaboration to achieve sustainable facility operation

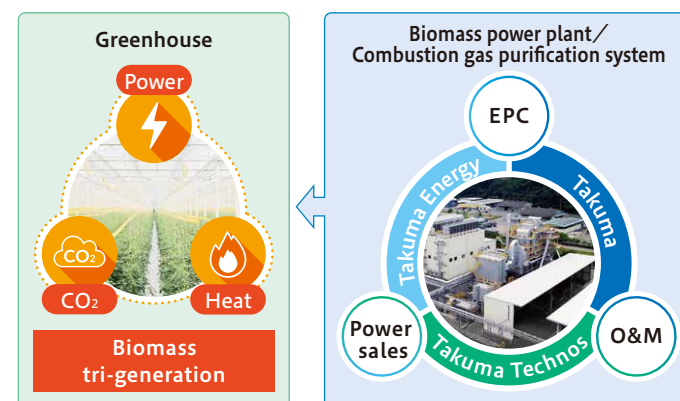
In this project, the Takuma Group came together to help achieve an innovative initiative being undertaken by SARA Inc.

The biomass power plant and combustion gas purification system installed in this project use lumber from nearby regions and imported wood products such as palm kernel shells (PKS) as fuel in a biomass tri-generation plant that supplies three types of energy necessary for facility operation: electricity, heat for heating and cooling use, and carbon dioxide for promoting vegetable growth. In this way, the facility can be operated in a sustainable manner.

Takuma and Takuma Technos will provide operational management and maintenance of the facility for 20 years after the start of operation. By deploying the **POCSYS**®, a proprietary operational support system, and applying expertise from DBO, O&M, and other projects involving municipal waste incineration facilities, it is possible to achieve higher-quality, efficient operation and maintenance management.

Group company Takuma Energy will purchase enough surplus electricity from the facility to fulfill the annual power needs of about 20,000 households, and some of that electricity will be supplied to local kindergartens, daycare centers, middle schools, and other facilities to encourage local consumption of locally produced power.

Customer	SARA Inc.
Project name	SARA Power Plant
Generating capacity	10,000 kW 80 million kWh annually (Enough to power about 20,000 households)
Principal fuel	Imported wood products such as PKS and lumber
Completion date	March 2019
O&M contract dates	April 1, 2019, to March 31, 2039 (tentative)



\*EPC: Engineering Procurement Construction

## Interview

We spoke to CEO Takenobu Kobayashi of SARA Inc., who played a central role in this project, about how he first encountered Takuma and his subsequent experiences.



**Mr. Takenobu Kobayashi**

CEO  
SARA Inc.

### Impressed by Takuma's frontier spirit and confident of its ability to overcome challenges together

In the run-up to the establishment of our company in January 2014, we were hard at work planning to build a large-scale vegetable farm at a reclamation site in the city of Kasaoka, Okayama Prefecture, which we considered a promising site. Our concept included using a biomass power plant to supply the three types of energy needed by the farm, specifically electricity, heat, and carbon dioxide. We met with several plant manufacturers as part of that process and spoke to them about the concept, but only one company indicated an understanding of our intentions and a willingness to embrace the challenges they posed together. I have a strong impression of that company's frontier spirit, which inspired it to boldly take on a tri-generation project in an unknown area of operations. That impression remains unchanged today.



### Feeling the appeal of a track record in extended operation that promised stable business profits

I knew that Takuma had a long and successful track record in biomass plant construction projects, but as we learned more about Takuma's conceptual and proposal capabilities in the thoroughgoing use of surplus heat and supply of CO<sub>2</sub> from combustion gas purification, which were new business domains, the company earned our trust and made us confident that our concept would in fact be viable and profitable. In this way, a process that included numerous discussions ultimately led to a facility that provided both economy and stability. I will never forget how we completed the world's first system to supply high-quality CO<sub>2</sub> by purifying combustion gases through a joint demonstration project.

### Proposal capability and human ability that led to a relationship of trust

Numerous people from different departments participated in the process of gaining an understanding of our concept and developing a variety of proposals to make it a reality, and all of them approached their task with an extremely high level of enthusiasm. It was truly a project that tapped the entire company. Each employee was appealing in his or her own way, and after each meeting I was left with a strong impression that Takuma is a trustworthy manufacturer.

One of the reasons we asked Takuma to build the plant was that I knew based on that impression that the company would continue to do its utmost in a spirit of good faith in design, construction, and after-sales service after we entered into a contract.

### A relationship that facilitates new value creation and application through continued exchanges

During the design and construction phase after we entered into a contract, each coordinator and site manager offered service in a spirit of good faith, and Takuma was able to deliver the plant on time without major incident. The facility continues to operate smoothly today.

Following the delivery of the plant, we entered into a long-term operational and maintenance management (O&M) contract with Takuma Group company Takuma Technos. The facility has only just begun to operate, but I trust that we will be able work together to maximize profits from power generation while minimizing running costs.

Additionally, through the power sales business operated by Takuma Energy, we're able to give something back to the local community together with Takuma, including by supplying power to local facilities. I look forward in the future to joining together to create and apply new value through business initiatives and continued exchanges.



# Contributing to the development of the sugar industry by helping lead the way to success in the form of stable production and power sales

Overseas business: Biomass Power Plant Construction Project in Thailand

Related SDGs

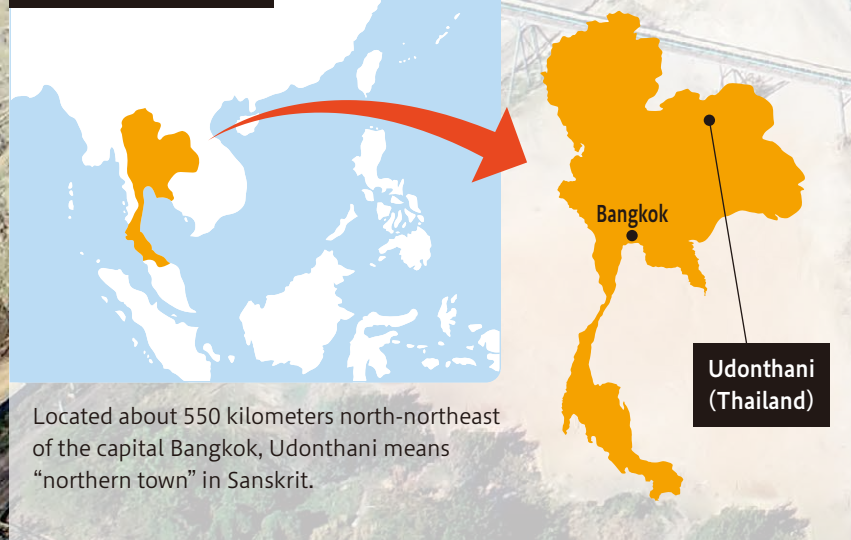


## Contribution of energy supply in Thailand

Thailand is the world's leading producer of sugar and the second-largest exporter of the commodity in the world. Since our establishment in 1974, we have become one of Thailand's premier sugar manufacturers. Recently, in addition to the sugar business, we are committed to becoming a producer of electricity using the renewable fuel bagasse (fiber remaining after sugarcane is crushed).

We have used bagasse-fired boilers from Takuma since our company's founding. More recently, we installed four more Takuma boilers to obtain a stable supply of steam and electric power in our new plant in Udonthani. Thailand needs a growing energy supply, and we look forward to contributing to the sugar business here by supplying clean energy from Takuma biomass-fueled boilers. It is our hope that Takuma and Siam Takuma will continue to provide plants engineered to facilitate environmental conservation and industrial development.

### Construction site



Thai Sugar Mill Group Co.,Ltd.  
Thai Sugar Mill Co.,Ltd.  
Thai Udonthani Sugar Mill Co.,Ltd.



Thai Sugar Ethanol Co.,Ltd.  
TSM Bio Energy Co.,Ltd.  
TSM Power Co.,Ltd.  
Thai Nakhonaburi Power Co.,Ltd.



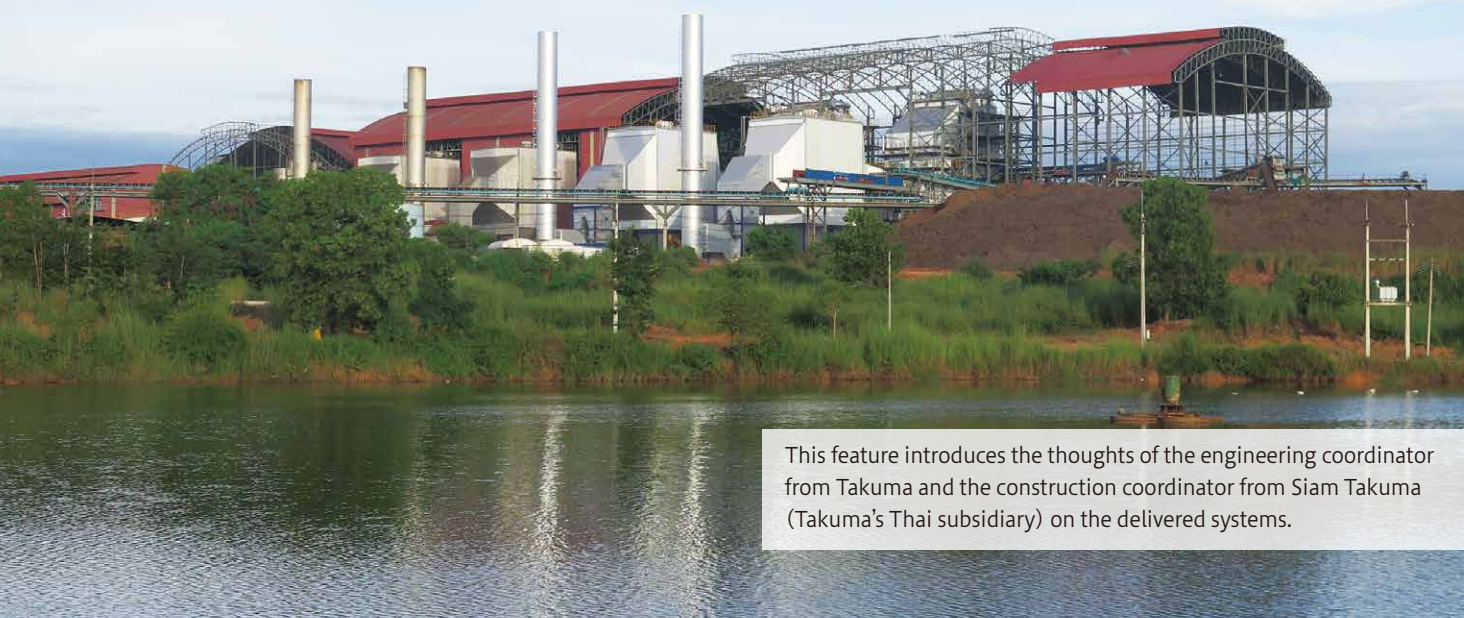
**Mr. Jetsada Wongwatanasin**

Managing Director  
Thai Udonthani Power Co., Ltd. (TSM Group)



## Contributing to the development of the sugar industry by helping lead the way to success in the form of stable production and power sales

Overseas business: Biomass Power Plant Construction Project in Thailand



This feature introduces the thoughts of the engineering coordinator from Takuma and the construction coordinator from Siam Takuma (Takuma's Thai subsidiary) on the delivered systems.

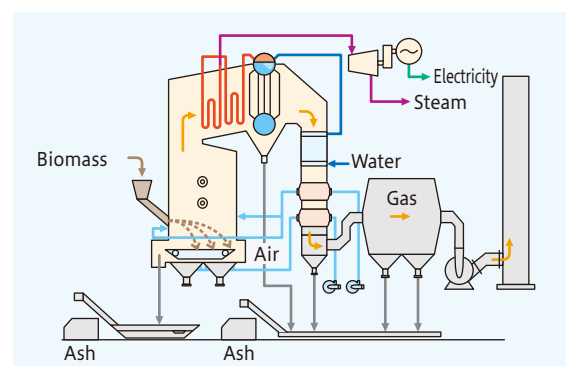
The customer for this project is an energy company in Thailand that operates a power boiler plant fueled by fiber remaining after sugarcane is crushed, which is known as bagasse.

Sugarcane harvested in the area is pressed at the adjacent sugar mill to produce sugar. By using the bagasse generated during that process to generate steam and electricity, the customer is able to use those products to power the plant and to sell surplus power back to the grid.

As part of the project, we delivered a new two-boiler power plant in order to supply additional energy (in the form of steam and electricity) needed as a result of an expansion of the customer's sugar plant.

We had previously delivered the facility's existing two-boiler power plant. Going forward, our four-boiler bagasse-fueled power boiler plant will contribute to the customer's ability to produce sugar in a stable and consistent manner while efficiently selling surplus power to the grid.

Customer	Thai Udonthani Power Co., Ltd. (TSM Group)
Project name	N-6500H Bagasse Fired Boiler
Fuel	Bagasse
Steam conditions	170 tons per hour × 4.2 MPaG × 450°C × 2 boilers (delivered in January 2019)
(Existing plant)	
Customer	TSM Power Co., Ltd.
Project name	N-5000H Bagasse Fired Boiler
Steam conditions	150 tons per hour × 4.2 MPaG × 450°C × 2 boilers (delivered in November 2012)



### Message from the engineering coordinator



#### Atsushi Nishina

Section 3, Energy Engineering Department 2  
Project Center

In this project, the customer already had experience operating a pair of Takuma boilers that had been delivered in the past. In light of the company's favorable evaluation of our boiler plant's operational track record and technological reliability, we were eager to plan and design a system so that we could deliver a high-quality product that would meet the customer's expectations.

I look forward in the future to planning and designing even better plants that take into account Takuma's record of success in Japan and overseas and to working closely with Siam Takuma's highly experienced staff so that we can supply high-quality plants that satisfy customers' requirements.



### Plant construction process

Boiler plant construction starts with the construction of the boiler building and then proceeds with the installation of machinery, piping, electrical equipment, and other components. Once those steps are complete, the entire facility undergoes adjustment and commissioning processes, and performance is verified before it is transferred to the customer. We carried out these tasks in line with a construction schedule and work procedures that had been carefully formulated based on our extensive experience.



Siam Takuma procured materials and equipment needed for the project and carried out construction and commissioning work with a focus on staying on schedule and ensuring worker safety.

Takuma focuses on getting work done safely while taking steps to ensure that materials and equipment are delivered on time and in line with the schedule and that all parties, including subcontractors, are able to communicate smoothly and effectively. In such construction projects, it is extremely important to work closely with the customer while building a trusting relationship during the construction process, which can take a long time.



### Message from the construction coordinator



#### Teekatat Promsungyang

Manager, Construction Section  
Siam Takuma Co., Ltd.  
(Shown at right)

At Siam Takuma, I am in charge of construction and commissioning work for Takuma boilers, and also responsible for safety and quality control management at construction sites and subcontractor factories. I also handle correspondence with Takuma to confirm specifications and requirements.

In this project, we installed two bagasse-fired boilers at Thai Udonthani Power Co., Ltd., which was already operating two Takuma boilers. Challenges included integrating the new systems into the existing plant, which was operating at the time, and keeping to a tight construction schedule.

Thanks to the cooperation of the customer and Takuma's Head Office, we were able to finish the construction and commissioning work generally on schedule. I was relieved and proud as I watched the row of four boilers begin operating together.

Takuma boilers are famous in the sugar industry in Thailand, where customers expect us to contribute to the supply of renewable energy in a country where biomass fuels are plentiful.