Technologies for Environmental Conservation

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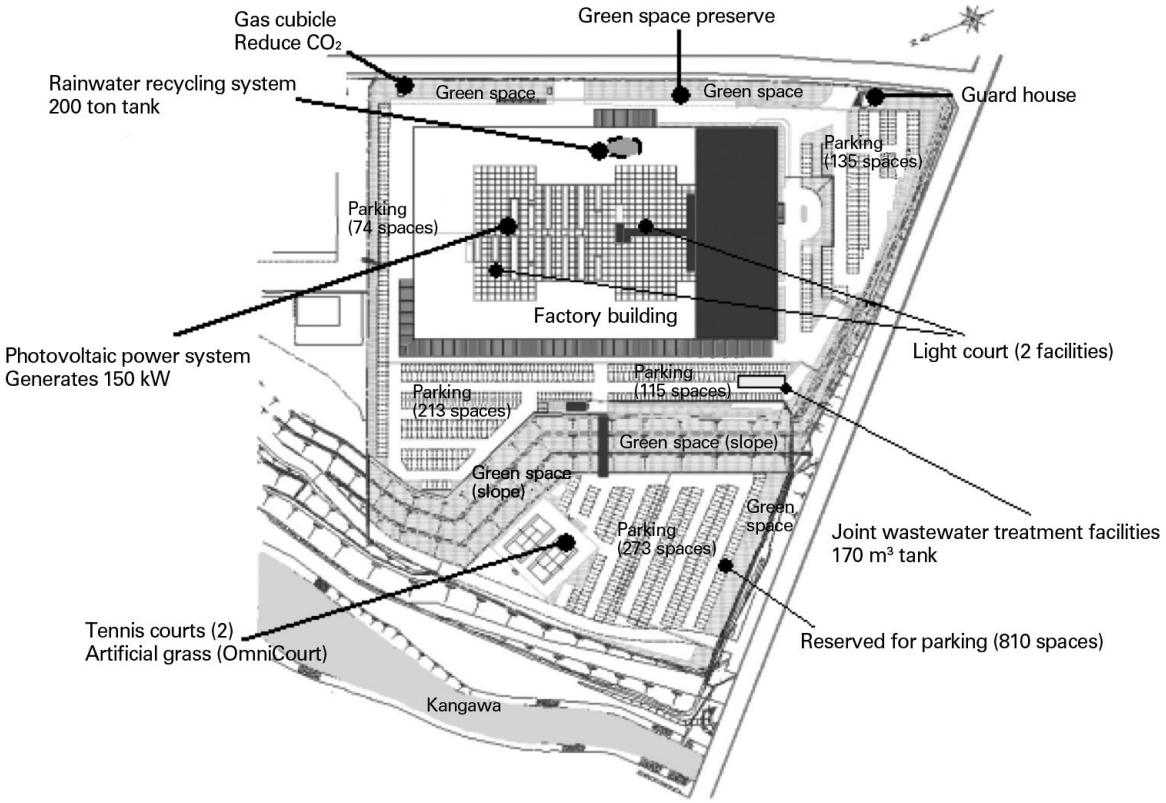
1. Introduction

The Ueda Office New Factory Construction Committee and Ueda Office New Factory Construction Executive Committee launched the construction of Kangawa works on February 15, 2007. Construction began in earnest with the goals of realizing integrated production for motors by combining Midorigaoka Works, Aoki Works, and Tsuiji Works, and constructing a factory that takes into consideration energy conservation and environmental conservation.

Groundbreaking took place on April 8, 2008, and the actual construction started on the 22nd of the same month. After nine months of construction, the factory was handed over on January 30, 2009, and after a ceremony to mark completion on March 6 of the same year, full-time operations started in May.

2. Overview of Kangawa Works

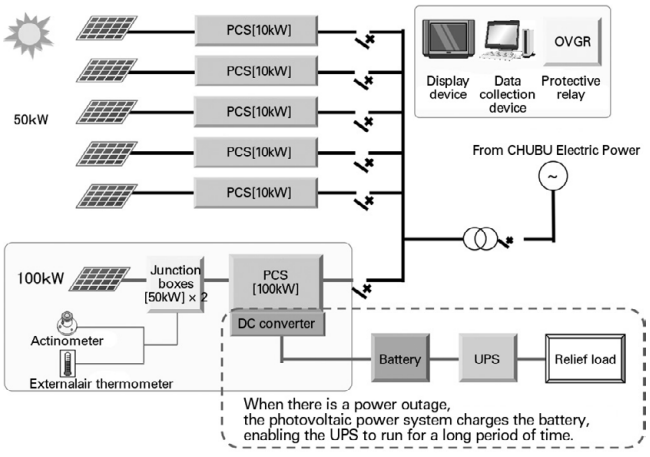
Kangawa Works covers an area of 67,000 m^2. There are natural green spaces throughout the terrain of the area and trees were planted to beautify the environment. Factory zoning laws require that 1/4 of the area include green spaces, but as a result of these efforts, Kangawa Works maintains more than this amount in green space. The factory building is a 110 m east-west, 180 m north-south, 18 m tall, four-story building with iron frame construction and a total floor area of 48,000 m^2.



3. Energy Conservation and Environmental Conservation

3.1 Photovoltaic power system

Photovoltaic power is clean energy that does not produce carbon dioxide, which is one of the causes of global warming, and it has come into the limelight in recent years. In Kangawa Works, a photovoltaic power system is installed on the roof of the factory building in consideration of the environment. The surface area for the battery panel installation is 3,000 m^2 with 860 battery panels. The battery panels face south and are tilted to an angle of 30 degrees, which increases the power generation efficiency and enables power generation of 150 kW. The DC power generated with the photovoltaic battery module is converted into AC power with high efficiency thanks to Sanyo Denki power conditioners (one SANUPS P83B unit and five P73D103 units). Furthermore, power is supplied to the factory through automatic controls over the entire system, so the excess power can be sold to the power company. The expected amount of generated power from the photovoltaic power system is 198,000 kWh per year, which at the same time will reduce the amount of carbon emissions by 109 tons of CO_2 per year compared to thermal power generation.

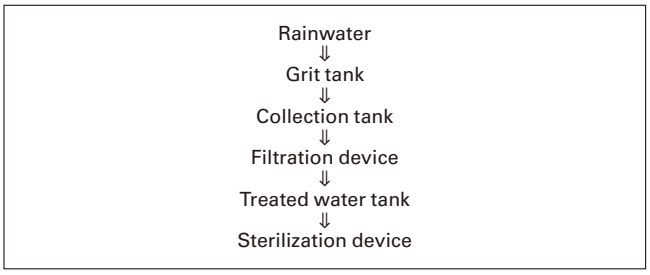


Kangawa Works photovoltaic power system diagram

3.2 Rainwater recycling system

The rainwater recycling system collects the rainwater that falls on the 4,500 m^2 roof of the factory building, runs the water through a filtration device and a pressurized water pump in order to use the water as sewage water for toilets in the factory. Furthermore, this water is also collected as water for fire-fighting purposes in an emergency, resulting in effective use of natural resources.

The amount of required water is 17.6 m^3 per day (with an estimated 1,100 employees × 0.8 × 20 L of water per day per person) and 3,520 m^3 per year. With about 1,923 m^3 per year or rainwater available, the water supply rate is estimated to be 55% per year (available rainwater divided by yearly water usage).

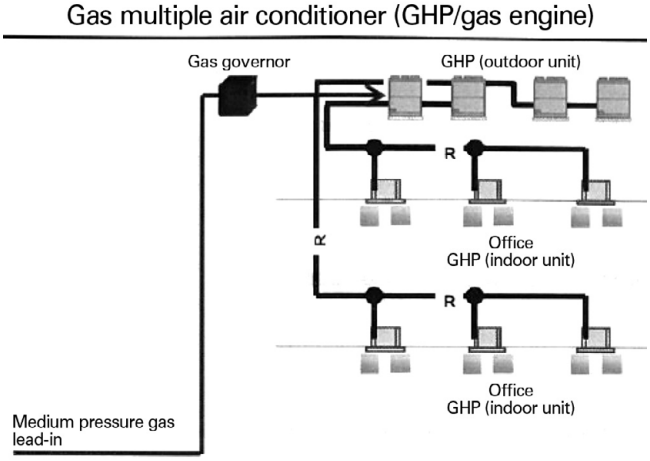


Rainwater processing flow

3.3 Air conditioning system

The air conditioning system in Kangawa Works employs a GHP (gas heat pump) system that performs cooling by running a compressor with a gas engine. At the heart of the compressor is a gas engine that drives the compressor. Thanks to an inverter control that rotates the engine the optimum number of times for the room temperature, this system can maintain a comfortable air-conditioned environment. Furthermore, the amount of power consumption can be kept lower than used by EHP (electric heat pump), making this a system that pays attention to the environment due to the energy conservation.

The estimated reduction in carbon emissions with the GHP air conditioning system is 300 tons of CO_2 per year compared to the EHP method.



System diagram

3.4 BEMS(Building and Energy Management System)

BEMS is a system that automates and centralizes the energy conservation management for all of the energy

facilities at Kangawa Works. With this system, energy usage in the factory and the operation status for the equipment can be viewed centrally, and due to the detailed management controls, Kangawa Works can achieve energy conservation by minimizing the energy consumption throughout the entire factory without wasting time or energy.

4. Factory environment

4.1 Anti-oscillation plan

Some equipment in the factory (such as pressing machines) causes vibrations. Foundational work and designs for a detached and isolated floor help to prevent vibrations, thus maintaining the environment inside and outside of the factory. We achieved the Ueda City Pollution Control Regulations and Standards with 70 dB within the lot lines and 65 dB or less at night.

4.2 Anti-noise plan

Soundproofed boxes are installed for equipment that produces noise (such as pressing machines), while the outdoor units of the air-conditioners are placed on the roof of the factory building, which helps to maintain the environment inside and outside of the factory. We achieved the Ueda City Pollution Control Regulations and Standards with 65 dB within the lot lines and 55 dB or less at night.

4.3 Anti-odor plan

To combat the odor (oil mist) from each type of work equipment, an electric precipitation oil mist collector was installed between the facilities and the ventilation ducts in order to maintain the environment inside and outside of the factory. The oil mist collectors used in Kangawa Works feature an electrode cleaning function that drastically reduces the required number of electrode cleanings compared to conventional electric precipitation mist collectors.

4.4 Wastewater processing

The joint wastewater treatment tank for domestic wastewater is located underneath the western parking lot. It is a PC box (precast concrete box) with the dimensions of W 5.1 m × L 24.24 m × H 4.3 m, and it uses a contact aeration process to handle an amount of 110 m^3 per day. The water emission standard is defined as hydrogen ion concentration (pH) or 5.8-8.6 or less, BOD (biochemical oxygen demand) of 20 mg/L or less, SS (suspended solids) of 30mg/L or less, and color or odor that will not cause the discharge location to take on a harmful color or odor. The wastewater at Kangawa Works is kept within the above standard.

4.5 Ventilation

Natural ventilation and mechanical ventilation are both established for the ventilation inside the factory. Natural ventilation involves windows in locations, sizes, and logical positions to facilitate the natural flow of air. Mechanical ventilation involves a system that introduces the outside air after adjusting its temperature with an AHU (air handling unit) in order to prevent negative pressure in the room from the ventilation equipment.

4.6 Natural light

The factory building area is very wide at 20,000 m^2. In order to help with lighting in the center of the factory, there are two glass-sided shafts that extend from the floor to the roof to create light courts (central gardens created for lighting). By providing natural light inside the factory, we can maintain a tranquil environment.

5. Conclusion

This document has introduced technologies for environmental conservation. Many people cooperated in accomplishing a factory that is primarily comfortable, not luxurious, and that pays attention to energy conservation and environmental conservation.

We will continue to focus on important environmental issues and implement adaptable environmental practices.

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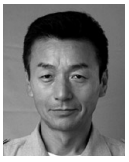

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