



Currently scheduled to install 11 units in a row in Niigata

2021年5月28日付 日本経済新聞社上



Signing ceremony of agreement with Mayor of Tsuyama City, Okayama Prefecture and President of JA Tsuyama



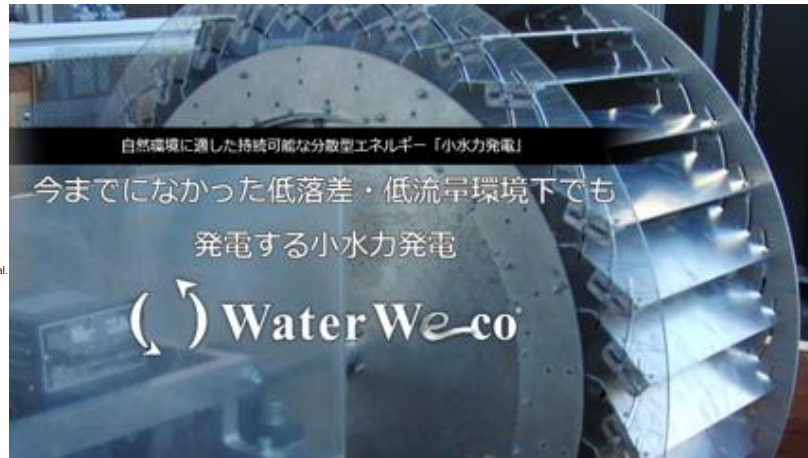
Facility inauguration ceremony with the mayor of Tsuyama, Okayama Prefecture

Image of Eco Station



Distributed renewable energy × IoT × Mobility as a storage battery

Sustainable economic cycle model that can be relieved even in the event of a disaster



Cases subordinate to conventional water use

Style1

Utilize the head of an existing agricultural canal

ELIS Power Plant (Business operator: ELIS CO., LTD.)
Niimi City Okayama Prefecture, Okayama Prefecture Niimi Regional Office Jurisdiction

Power generation using the head of the iron canal installed in the agricultural canal of the Takao Building
Useless Water Association. Through the supply of electricity from natural energy, it contributes to global warming countermeasures and raising awareness of regional mini hydropower generation.

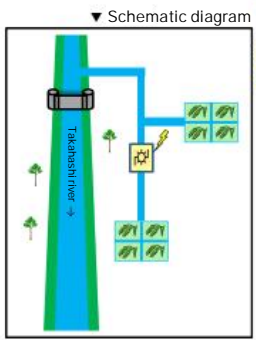


▲ Situation before installation of power plant

- Specification
- River name Takahashi River system Takahashi River
- Effective head 1.30m
- Maximum water consumption 0.809m³/s
- Maximum output 6.90kW
- Types of water wheel Open-type Breastshot Water Wheel
- Types of generator Permanent magnet type three-phase synchronous generator



▶ Current situation after installation of power plant



▼ Schematic diagram

- Point
- Subordinate power generation that generates power within the range of agricultural water intake for which conventional water rights have been notified.
- Utilizing the head of an iron canal installed in an agricultural canal.
- It is not a new water intake from a river for power generation.
- Simplified documents attached at the time of application due to subordinate power generation.
- Registration with a one-year permit period based on one-year flow rate data.
- Local adjustments for power plant installation
- Scheduled to be posted from Attachment 3 under request

Micro-hydroelectric power generation is now possible even in low head and low water flow.

(Domestic patent has been obtained for Flow rate change corresponding structure)

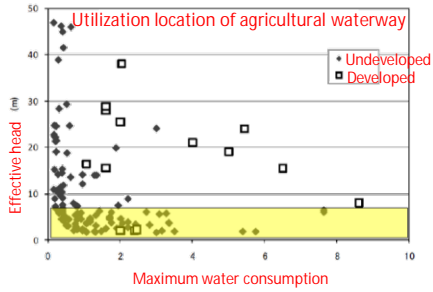
※World patent pending now, WaterWeco® was acquired trademark and design

| | | |
|----|---------|----------|
| 型式 | 400-300 | 1000-300 |
| 径間 | 0.7 | 1.5 |
| 径間 | 0.7 | 1.5 |
| 径間 | 1.100 | 1.100 |
| 径間 | 2.0 | 3.2 |
| 径間 | 1.1 | 1.8 |
| 径間 | 3.000 | 3.100 |
| 径間 | 0.9 | 1.1 |
| 径間 | 0.900 | 0.900 |

Output is stable even when the flow rate changes

Support for Okayama Industrial Promotion Foundation,
Collaboration of Nagasaki University and West Japan Fluid Engineering Laboratory Co., Ltd.

WaterWeco® Application range

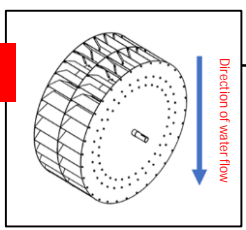


Source: Agency for Natural Resources and Energy 20th year of the Heisei period Small and Medium-sized Hydropower Development Promotion Guidance Project Basic Survey Report



Breastshot Water Wheel

NET yield Maximum 11.25%



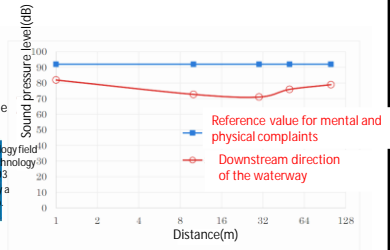
Result: Takao ELIS Power Plant

Operated from March, 2016 Operating steadily even now

We achieved total efficiency over 50% by flow rate change corresponding structure.



Environmental Technology Verification project
ETV Ministry of the Environment
Global warming countermeasure technology field
Small and medium-sized hydropower technology
Demonstration number No.120-163
The performance demonstrated by a third party is published on the web
<http://www.etcv.go.jp/policy/etbv/>

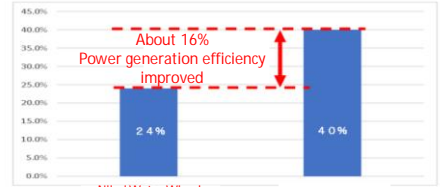


As a result of a survey by the Ministry of the Environment's environmental technology demonstration project "ETV" designated organization, Normal noise and low frequency was also below the reference value for mental and physical complaints (measurement height about 1.5 m, measurement time 1 minute, respectively) at 1 m point, 10 m point, 30 m point, 50 m point, and 100 m point in the downstream direction of the Takao ELIS power plant in Niimi city.

Remote monitoring system

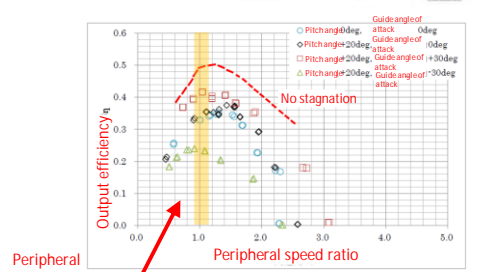


Operation management is carried out monitoring system which is used safety management technology of LP Gas jointly developed by ELIS Group companies, which have been in business for over 60 years, and Toyo Keiki, a manufacturer of remote monitoring systems, and can minimize operating costs. In addition, a surveillance camera can be installed, so you can check the local situation in addition to the power generation status. It is useful not only for reducing maintenance costs but also for visualizing the power generation status.



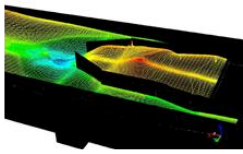
A model of a water turbine that sells electricity at the Takao Aqueduct in Niimi City

Water turbine model researched and developed this time



$$\text{Peripheral speed ratio} = \frac{V_r}{\omega r} = \frac{\pi \times \text{Diameter} \times \text{RPS}}{60} \times \text{Flow velocity}$$

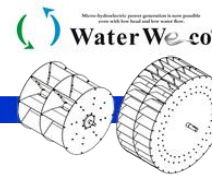
Example: $\frac{\pi \times 3.15 \times 7}{60} \times 1.2 \text{ m/s} = 1.0$



Fluid analysis



Model experimer



Productization

The impeller design is optimized by hundreds of patterns of model experiments (designs registered in each country)



4 features

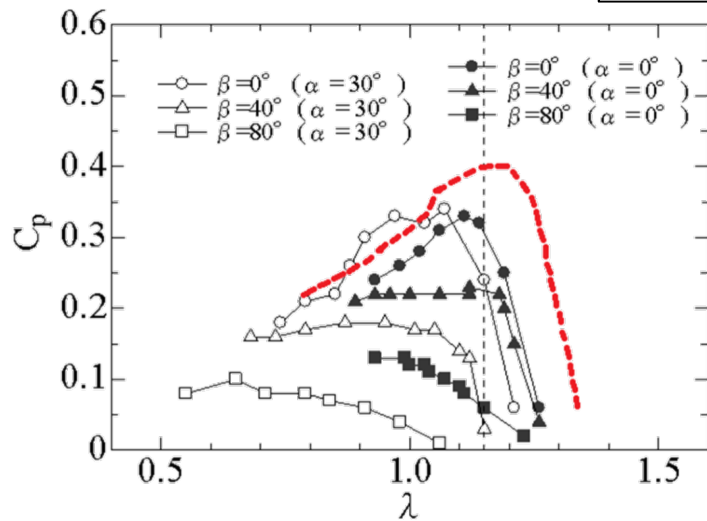
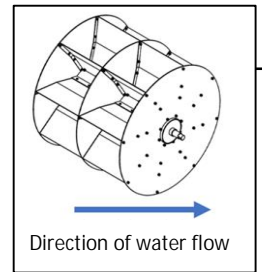
- 1 . Proprietary remote monitoring system
- 2 . Civil engineering work unnecessary
- 3 . Dust control and easy maintenance
- 4 . In-house original generator

Undershot Water Wheel

Kuwadani ELIS Power Plant in Tsuyama City

Operated from November 2018

The generated electricity is used as a power source for ultra-compact mobility coms.



ELIS-GENERATOR (Original generator)



Permanent magnet type multi-pole single monk multi-pole single-phase motive multi-pole single-phase synchronous inner rotor generator

| Item | Diameter | Height | Width | Weight | Phase number | Rated voltage |
|------------|----------|--------|-------|--------|--------------|---------------|
| Unit | mm | mm | mm | Kg | Phase | Volts |
| ML-5K type | 532 | 582 | 178 | 90 | Single phase | 100/110 |

Since it is suitable for low torque and low rotation, the acceleration ratio can be low, the corresponding years are long, and if it is rotated at a constant rotation speed, AC 100V electricity can be taken out.