

## Telemetry System for Irrigation

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### ABSTRACT

The Royal Irrigation Department (RID) is a government organization under the Ministry of Agriculture and Cooperatives of Thailand. RID is responsible for seeking water resources for retaining, controlling, transferring, releasing, or sharing those water resources for the usages in agriculture, energy, public utilization, or industrial uses. The responsibility also includes prevention of water damage and water transportation within the areas of RID jurisdiction which comprises of 25 large size reservoirs, 412 medium size reservoirs, and a large number of small size reservoirs in Thailand.

The Bureau of Engineering Topographical and Geotechnical Survey is responsible for surveying the area and volume capacity of these reservoirs under RID jurisdiction. With these numerous reservoir sites, the various innovative concepts of technological application were initiated in order to improve the engineering survey in water resources management and irrigation operation. Therefore, the innovative Telemetry system was established for RID with the general objective reducing costs and increasing productivity of the surveying equipment. In order to achieve this objective, the specific objectives are following 1) to reduce cost of the equipment purchasing; 2) to reduce cost of the construction building; 3) to simplify installation and maintenance; 4) to reduce cost of the network communication and increase the data transmission frequency; and 5) to provide people accessing the information conveniently.

The innovative Telemetry system includes five features as follow; firstly, the Real-Time Kinematic, Global Navigation Satellite System (RTK, GNSS) technique was applied to measure the water level, which does not required submersion under water as the traditional bubble gauge. Secondly, there was no need to build a large building for traditional telemetry equipment. Due to low power consumption devices, a solar energy can be used which also enable the installation in the remote area where is far from the conventional electricity sources. Thirdly, this innovative Telemetry system was built on a small size of Buoy station which is not much maintenance and prevents any damage of equipment caused by water submersion. Fourthly, the NB-IoT communication protocol was used instead of the traditional 2G/3G communication protocol, so that the costs associated with data transfer traffic are reduced significantly. Lastly, the web application and mobile application were built for presenting the real-time data and updating relevant information that can be quickly used for operating and managing the irrigated water.

As a result, the compositions of the innovative Telemetry system are shown in the Fig.1 which consist of the Buoy station with Solar panel, RTK GNSS, Data network NB-IOT, Database system and Web/Mobile application. The Telemetry system can provide a real-time data such as water level, storage capacity, reservoir surface area, rainfall, temperature and humidity. All data can be seen by real-time on mobile devices via mobile application and web application; <http://rid-iot.serveftp.net:8080/index.html>. They are not only presented in a numerical data, but they can be displayed through graph and table also. Recently, this innovative Telemetry system has been used for

many dams and reservoirs in the RID's responsibility. One example is shown in Fig.2, Huai Sai Khamin Reservoir, Sakon Nakhon province, Northeastern region of Thailand.



Fig.1 Compositions of the Innovative Telemetry System



Fig.2 Applying the Innovative Telemetry System to Huai Sai Khamin Reservoir, Sakon Nakhon province, Thailand.