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The Calibration Curve for Irrigation Reservoirs by Survey Tool Innovation

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ABSTRACT

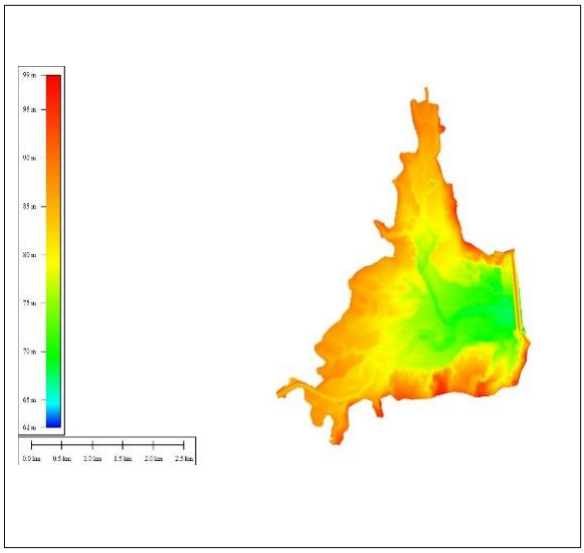
The Royal Irrigation Department (RID) is mainly responsible for seeking the water resources and increasing the irrigation area according to their potential and natural balance, including managing and operating irrigation water efficiency to water use objectives. Currently, there are a lot of dams and reservoirs in responsibility of RID. Several of them have been used for very long time, as a result, the sediment deposition in the reservoirs. Consequently, water level and storage capacity have changed. The relationship between these factors and the typical reservoir operation rule curve is completely incoherent. According to the traditional surveying in the past was obsolete, the topographical data using to perform a rule curve is not enough details. This can cause discrepancies in the typical rule curve data significantly. In order to address this issue, the Bureau of Engineering topographical and Geological Survey's team presented the process innovation of the engineering survey. Ground survey, underwater survey, and aerial survey have been taken into this mission.

The various surveying methods and tools have been integrated to calibrate a reservoir operation rule curve, as showing in Fig.1. So that the real-time kinematic global navigation satellite system (RTK GNSS) technique and the traditional Total Station were used to retrieve a positioning including both vertical and horizontal position. A sonar echo-sounder was used to measure the water depth. The unmanned aerial vehicles (UAV) with RTK GNSS on board was used to acquire a 3D elevation data (Point clouds) and aerial photographs. After that all data from those survey methods were analyzed and performed a digital elevation model (DEM) covering over the area. Then, the reservoir operation rule curve was adjusted accurately. Finally, the result of the calibration curve can be taken into account for dredging to increase the reservoir capacity in accordance with the amount of runoff that flows into the reservoir.

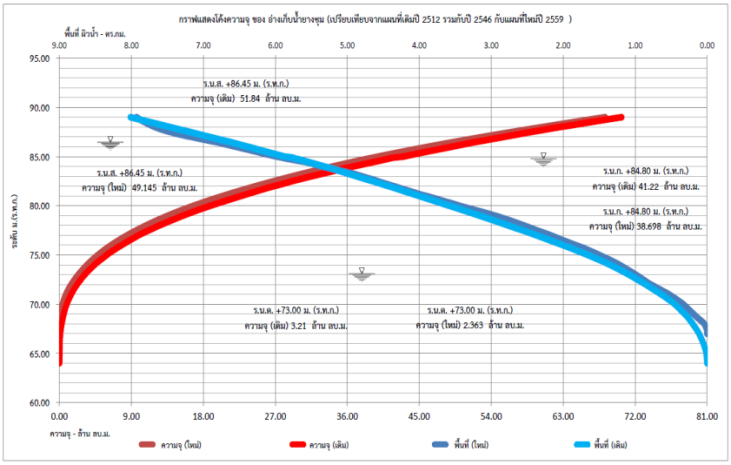
To sum up, this calibration curve by surveying integration has been utilized for many areas of RID, for instance, in case of Yang Chum Reservoir in Prachuap Khiri Khan Province where needs to increase the storages for more efficient reservoir operation was selected. The example of products and final results of the calibration curve are shown in Fig.2.

Fig.1 surveying tools or methods integration for calibrating reservoir operation rule curve

(2.1) Ortho aerial photo



(2.2) DEM data



(2.3)

Fig.2 Products and results of the calibration curve for Yang Chum Reservoir, Prachuap Khiri Khan Province, Thailand.