



OTT Hydromet Application Notes / Success Stories

Precipitation monitoring in high altitude – Valle d'Aosta

Autarkic station with OTT Pluvio² with 400 cm² orifice without heating



Background

So far, the water management board of Valle d'Aosta used to operate precipitation measuring sites in the vicinity of ski resorts, as infrastructure like mains and easy access to the area were available there.

Anyway, the data delivered by the deployed tipping bucket gauges wasn't precise and reliable enough due to problems with moving mechanical parts and the melting of snow into liquid.

Precipitation monitoring in remote areas without infrastructure was even thought to be impossible.

All the more challenging was the task to install a measuring site on the Peak CIMO Blanche with its height of 3000 m, located near the famous Matterhorn.

The measuring site would have to withstand the extreme weather conditions in this altitude with snow thunderstorms and wind speeds of up to 200 km/h which transport masses of the relatively dry snow, forming snow heights of 3-4 meters.

Task

Set up of a precipitation monitoring station for liquid and solid precipitation with the following features:

- Power consumption not higher than 0.2 Watt with a small solar panel (30 Watts) to withstand even high wind speeds.

- Size of collecting bucket must be big enough to catch and collect the expected snow masses (transformed into liquid by anti freezing agent). The design of the orifice should prevent the building of snow caps.
- Provision of reliable precipitation data, compensated for wind- and temperature influences. Dynamic threshold values for extremely high or low precipitation intensities.
- Accumulated precipitation data should include information on temperature and evaporation to determine snow mass and its water equivalent by a model calculation and multi-source data processing with no need to make snow height measurements.
- Maintenance-free, unattended long term deployment; status information and monitoring of bucket fill level to ensure timely (4-6 months) or immediate (if required) remedy action should be provided by data communication via GPRS as remote online monitoring system.
- In December 2008 OTT was requested to provide a complete turnkey solution including data hosting and web services.

Solution

- OTT Italy/Corr-TEK has designed, supplied and installed a measuring station consisting of: OTT Pluvio²_400 fixed in 2 m height at a mast, a datalogger OTT DuoSens, a GPRS modem and a 30 Watts solar power supply including charger and 6Ah battery.

- OTT Pluvio² with 400 cm² orifice and a bucket volume of 750 mm is an all-weather gauge that measures both, liquid and solid precipitation, it runs absolutely economical with a power consumption of only 15mA@12 VDC and its design prevents the building of snow caps on top.
- The measuring range for long term deployments is approx. 3-4 meters of snow mass or 600 mm of precipitation, based on the calculated average of 150 mm of evaporation over a period of 6 months. The operational temperature ranges down to -35°C, provided that the bucket is filled to 35% with anti-freezing agent which turns solid into liquid precipitation.
- A guided accuracy test can easily be carried out directly at the measuring site with reference weights, and a laptop with standard USB interface; a test report is provided directly. To make this test once per year is the only quality inspection needed.

Technology

Precipitation gauge OTT Pluvio² for liquid and solid precipitation

Datalogger OTT DuoSens, GPRS modem and solar power supply

Data communication via Internet, Datahosting

More information on OTT solutions and products on: www.ott.com

Advantages

- Absolute reliability and data availability of 99,9%, low total costs of ownership even at remote sites thanks to unattended operation, site visits reduced to a minimum.
- Recalibration is no longer necessary as the OTT Pluvio² with its hermetically sealed load cell has a unique "lifetime calibration". A field replaceable load cell is available.
- The combination of rugged design and construction and the use of best quality materials, high-grade plastic, stainless steel and aluminium alloys make the OTT Pluvio² an absolutely reliable instrument for long term applications.
- GPRS data communication and precipitation data monitoring is accessible from nearly any place and at any time via standard internet lines for all operators and users.