

The First Real-Time, Full-Length Runway Water Level Indication Solution

/ VAISALA AVIMET® RUNWAY WATER LEVEL INDICATION SYSTEM (RWLIS)



VAISALA

Plane Sailing – the Last Thing a Pilot Wants



The Vaisala AviMet® Runway Water Level Indication System is the only real-time water level and flow assessments solution for landing and take-off.

Aquaplaning

Most car drivers know the fearful moment of suddenly losing control for a fraction of a second on a wet road during heavy rain. Now, upgrade that to a pilot's experience when skidding along a flooded runway without wheel brakes at 150 knots, while responsible for the safety of 400 plus passengers on a plane worth \$200 million.

Nobody wants that experience and the potential consequences. Not the pilots or the crew, nor passengers, air traffic controllers, airports, airlines, aviation authorities, insurance companies, travel companies, aircraft manufacturers or rescue crews – no one. Not once. But so many have, until now.



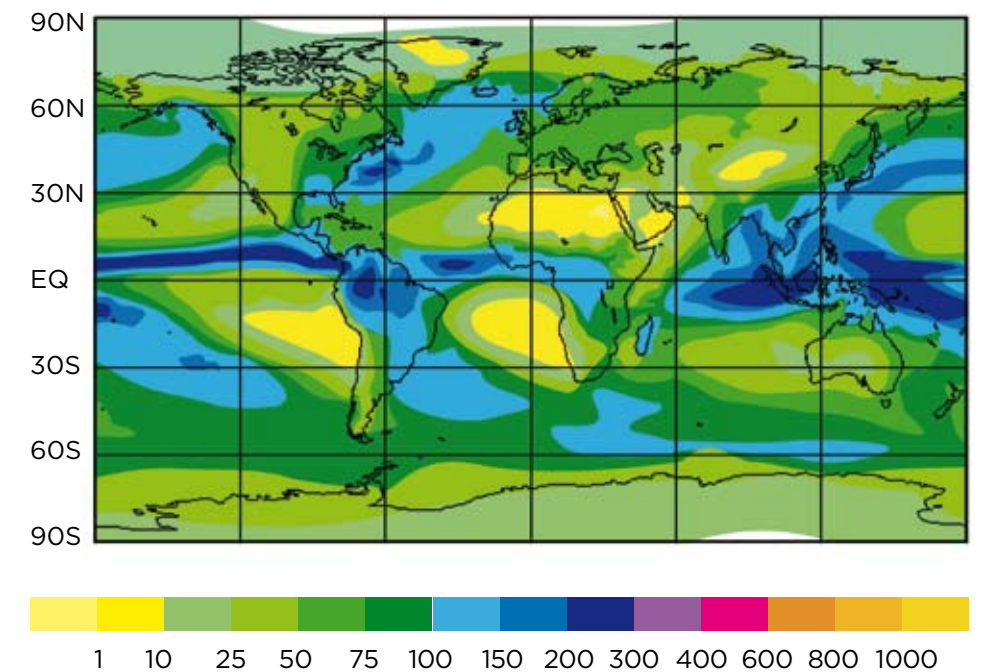
Hundreds of airports on both hemispheres suffer from heavy sudden rainfall that creates danger, disrupts operations, costs money and inflicts revenue loss. And these incidents seem to be more and more frequent. With growing air traffic volumes, a grooved runway will not completely eliminate the risks during heavy downpours.

Answering the Pilot's Demand

According to studies, over 80% of pilots would like to receive water level information when the water level exceeds 3mm. Over 70% of pilots value the information when preparing to land, and over 60% when preparing to take-off. Aquaplaning is involved in approximately 15% of all overruns.

Changi Airport and Vaisala Initiative

Singapore's Changi Airport, the innovative multi-awarded South-East Asian international hub is known as the benchmark of service excellence to both professionals and consumers. In 2007, the Civil Aviation Authority of Singapore (CAAS) approached Vaisala for a reliable technology solution for full-length, real-time runway water level indication system. The objective



Annual rainfall in mm/month (source: www.physicalgeography.net)

was to offer new relevant safety information as well as to create another service innovation that saves costs and enhances the attractiveness of the Changi Airport to all audiences.

As a result of the Civil Aviation Authority of Singapore (CAAS) and

Vaisala co-operation, there is now a technology solution that gives the ATC and pilots all the required information in a scientifically accurate, cost effective and user friendly way.

Vaisala AviMet® Runway Water Level Indication System

The Vaisala system is the only real-time water level and flow assessments solution for landing and take-off. Instead of limited and unreliable spot-based measurements, the Vaisala system provides accurate constant information of the full length of the runway. The system monitors three runway segments as downpours can be localized and variable, resulting in different conditions along major runways.

ICAO recommends that up to date conditions of the movement area and other information of operational significance, such as runway wetness and friction, should be made available to arriving and departing aircraft. And whenever water is present on a runway, a description of the surface conditions including an assessment of water depth, should be provided.

New Thinking and Technology

The system employs highly accurate Vaisala DSC111 Remote Surface State Sensors that measure the actual real-time runway water level using proprietary Vaisala laser solution and algorithms.

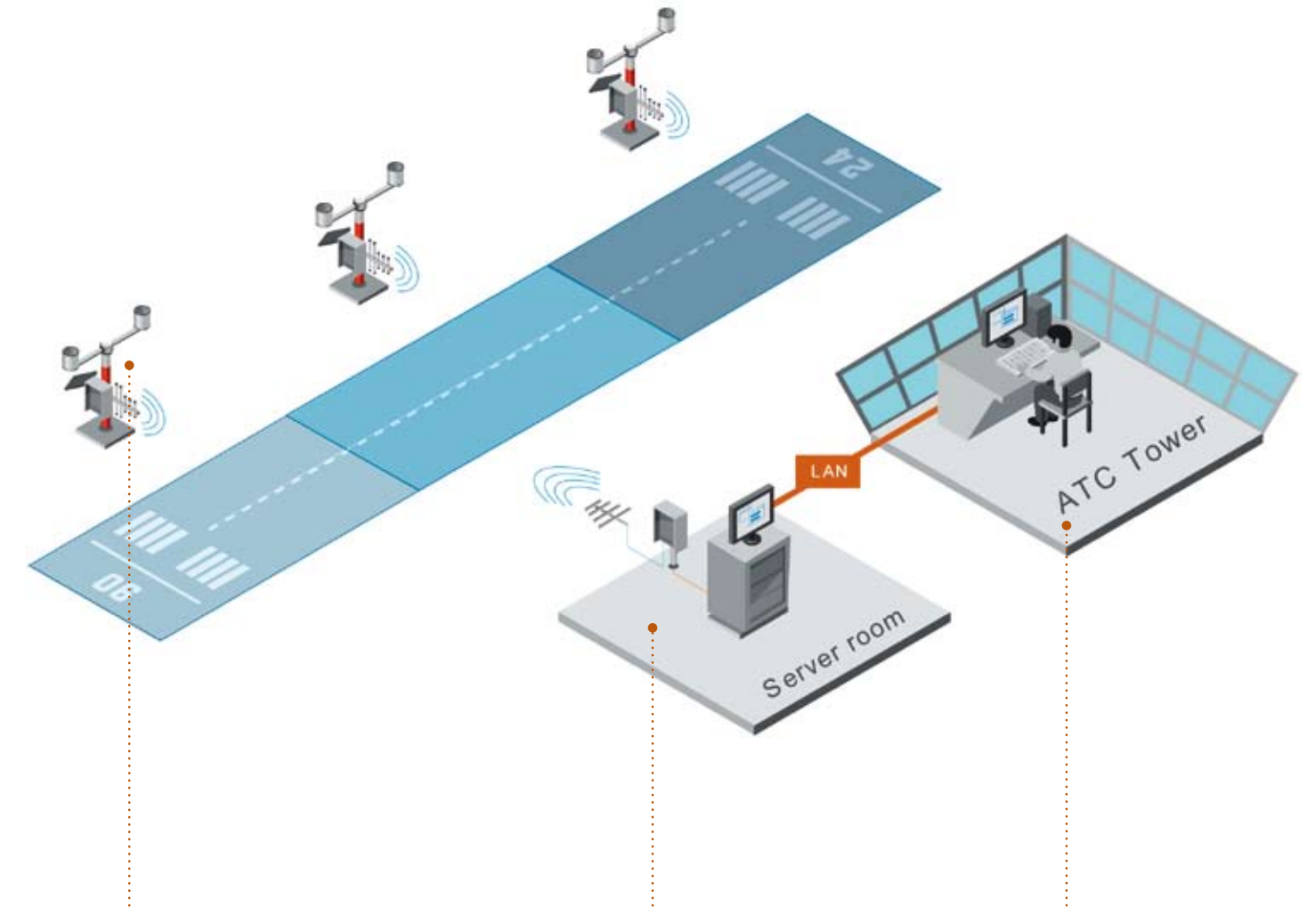
Advanced Calibration Process

The laser/algorithm-based calibration, also known as aquamapping, is combined with a wide range of collected information of specific local conditions and features, such as weather and rainfall characteristics and physical features of the runway. The runway slope, macro profile and micro texture are augmented by other measurements that enable the system to produce both

real-time assessments and accurate projections of runway characteristics in different wet weather conditions.

User-Friendly Safety

The science and technology of the system are world leading, and so is user friendliness. The water-level information is provided to pilots on three runway segments in the same familiar way they are used to receiving Runway Visual Range data from the ATC. For example,
*SQ801, at One Six Three Zero UTC
 Water layer thickness Runway Zero
 Two Center
 Touchdown three millimeter
 Mid-point five millimeter
 Stop-end one millimeter*



Vaisala Stand-Alone Automatic Rain Stations, including:

- Double rain sensors
- Data logger
- Radio modem communication
- Solar panel

Central Data Unit, including:

- Radio modem communication
- Rack mounted server
- AviMet® server software
- Control and maintenance software
- UPS backup

Atc User Interface Workstation, including:

- Display software

Plane Benefits



Safety is naturally the main installation driver, but the Vaisala AviMet® Runway Water Level Indication System also offers a wide range of business benefits with positive impact on revenue, savings and image.

Installation and Maintenance

At the first stage, Vaisala engineers install the technical system

Knowledge Means Safety:

- Enhanced landing and take-off safety – abort landing, abort take-off or delay departure
- Better landing and safety planning to avoid unexpected conditions
- Optimized effective wheel-braking action in addition to flaps, spoilers and reverse thrust
- More accurate performance calculations

elements according to the size and other physical characteristics of each runway. This is followed by

Knowledge Means Efficiency and Business:

- Optimized aircraft power and performance – economy of using flex instead of max
- Less wear and tear for the engines and plane during take-offs and landings
- Minimized fuel consumption
- More efficient and accurate traffic movement planning
- Savings from avoided overruns – excursions – and fewer costly incidents and accidents
- Asset for lower insurance rate negotiations
- Valuable service feature for all stakeholders enhancing airport brand image

“aquamapping”, the scientific risk assessment of the aquaplaning risk by using Vaisala’s patented laser technology and algorithms as well as hands-on measurements and structural observation. First charting the runoff properties of the runway and then monitoring its standard rainwater accumulation for reference.

The methods are advanced, but the result is an accurate and robust automated system.

The risk assessment and calibration should be repeated annually and always after structural changes. The area being monitored does not need to be closed to traffic, except for the first reference charting, and also this can be made during regular maintenance breaks. Otherwise the system requires minimal care – usually regular checks and clean-up of the rain gauges is enough.

Commitment and Care



Vaisala has provided market-leading meteorological measurement systems for scientific, commercial and military purposes since 1936. Now we are known as the first-choice supplier of technologies and weather solutions for the majority of the world’s airports, meeting the highest standards and also catering for special requirements.

Cost-Efficient Quality

Our global service organization provides all the necessary services for the AviMet® Runway Water Level Indication System, including aquamapping, annual maintenance and spare parts service.

Also more extensive service packages can be tailored to the customer’s specific needs.

Our aim is to always offer superior performance through leading science, technology and service. Constant innovation produces rugged reliability with low lifetime costs. Our commitment and helpful customer support is the global benchmark, proven by a large number of long-term partnerships, spanning decades.



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