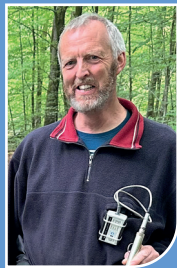


UPCYCLING SENSORS FOR SUSTAINABLE NATURE MANAGEMENT

Klaas Van Der Meulen
Verbelco



“When sensors made by KELLER Pressure are deprecated, it means something different from other manufacturers. They can carry on working seamlessly for years to come.”

A Dutch water board has donated deprecated groundwater data loggers made by KELLER to Verbelco, who has used them to create a sustainable, hydrological monitoring system in the Leuvenum Forest in the Netherlands. At KELLER Pressure, deprecating products does not have to mean scrapping them. The products made by the Swiss sensor manufacturer last a long time and can work without problems across many life cycles.

Thanks to the work of a few dedicated individuals – and to groundwater data loggers from KELLER Pressure working behind the scenes – walkers can wander around the Leuvenum Forest for hours on end. The rewilding of the woodland enabled the establishment of an impressive nature management system with sustainability as the top priority.

The three key players in this project are Verbelco, a hydrology and automation specialist, Buijs, a hydro-ecological research and advice group, and the water authority Vallei en Veluwe. KELLER products, with their impressive accuracy, resistance and durability, also played a very important role in this.

Leading hydrologists

Klaas Van Der Meulen from Verbelco is an ambitious hydrologist and is always looking for opportunities to make data and measurements more accessible. Hydrological monitoring information is available in the internal database and is not saved anywhere else. Verbelco offers a standard version of its app for general use with graphs for the water level, the rainfall and evaporation from the nearest automatic weather station (KNMI) as well as online maps of the measurement network. Professionals can use the additional functions of combining, editing and exporting the data sets.

René Nuijs from Buijs Hydro-Ecological Research & Advice turns specially designed measurement setups into a reality. As a hydrologist with a sound scientific background, he has brought his experience of impact analyses to bear in countless reports and projects and he is happy to be contacted for recommendations or for enquiries.



A nature reserve in its own equilibrium

Leuvenum is a nature reserve in the Dutch province of Gelderland, not far from the capital city Amsterdam, and is part of the «Veluwe» – the largest continuous woodland in the Netherlands. The «Leuvenumse beek», a 25-kilometre-long stream and the longest flowing body of water in Veluwe, runs through the middle of the beautiful trees, the silt and the fragrant meadows.



Ewa van Kooten from the water authority “Vallei en Veluwe” has been dedicating herself to managing this unique area since 2014:

First the water quality was improved and then the streambed was raised using extra sand and pallets. This reconnected the stream and the bank, creating a dynamic stream valley in the forest. Now, when there is heavy rain, this section of the forest floods and the rainwater can sink into the groundwater. The system finds its own equilibrium, but the water authorities must be able to control and monitor it to prevent potential damage occurring outside the forest.



René Buijs and Klaas Van Der Meulen installing the DCX-22AA data logger

Reliable, sustainable measurement setups

For Verbelco, the challenge lay in providing tailored measurement setups in remote natural areas – a setting without controlled test environments. Furthermore, only sustainable products should

be used, such as re-usable protective tubes made from stainless steel and untreated, sustainable, local wood for the measurement setups. Verbelco and Buijs Hydro-Ecological also wanted sturdy, reliable measuring devices that fit into tight tubes and require a bare minimum of attention.

To that end, water level measuring points were set up at various strategic locations. There are absolute measuring points for groundwater as well as relative measuring points, which measure underwater.



It took some years to find the right measuring devices, as Klaas Van Der Meulen confides: *“After some wrong turns in the early years, we landed on KELLER. The Swiss pressure management technology manufacturer offers very reliable and exact sensors with replaceable batteries. Durability, which is synonymous with KELLER, was a key criterion alongside reliability. A water authority donated KELLER groundwater data loggers that were no longer needed to us so that we could reuse them for projects such as these. Giving an item that is no longer in use a new lease of life is called upcycling; this makes a huge contribution to protecting resources, the environment and nature.”*

Verifiable upcycling

Until last year, Verbelco was still using the first data loggers from KELLER with quadratic baro housing and an aluminium seal cap. These have been working without fault for almost 20 years.



Shortly thereafter came the the latest, round 22 mm stainless steel DCX22-AA model. The serial numbers on the devices of this make that Van Der Meulen has been using are less than 1,000. In comparison, current data loggers from KELLER have a serial number of well above 30,000.

Measuring points that are often underwater are fitted with absolute KELLER DCX22s. For dry measuring points, the relative DCX22-AA data logger, with an atmospheric pressure sensor on the tip, is used. The DCX22-AA is just the right length that there is space next to the cable in the PVC groundwater level tube to allow some hand space for carrying out checks.

For Verbelco, the data logger's life cycle has not yet come to an end. Klaas Van Der Meulen is already thinking ahead: "When a KELLER data logger with an extra long carrying cable is then hung on another tube, luckily the cable happens to be long enough to tie it to the tube quite easily".

Maximum accuracy for over 10 years

Circa 2003, Verbelco and Gerrie Konig, who was the measurement network manager in the province of Utrecht at the time, created an overview of user needs in relation to pressure transducers, software and settings. At that time, there was already an emphasis on the importance of checking the accuracy of measurements on location. For this reason, the opportunity eventually arose to take measurements online, which allows you to check manual tuning directly and to calibrate the sensors.



When the first prototype emerged during this period, all those involved came together and ran extensive calculations for its accuracy. The province of Utrecht even tested the specific weight of the water to cover all variables. Klaas Van Der Meulen can remember this well:

"The result was that we had a negligible deviation of 1 mm, which

outweighs the accuracy of manual measurements. I think that the province of Utrecht was the first to make extensive use of KELLER sensors in the primary measurement network"

Remote transmission of hydrological data to the government

Things have come on a long way since then. Buijts Hydro-Ecological Research & Advice recently installed multiple ARC1-Tube remote transmission units, from KELLER, in the Oostvoorne dunes, near Rotterdam.

Verbelco seamlessly sends the data collected to WaterWeb, an online hydrological database, each day. Natuurmonumenten, an association which purchases, protects and manages nature reserves uses automated data transmission of this kind to access high-frequency telemetric, independent water level measurements in addition to manual ground and surface water levels, drilling descriptions and photographs from each location throughout the entire country on one, single system.



Data logger DCX-22AA

The hydrological data is used by hydrologists within the Natuurmonumenten organisation and regionally by ecologists. Online access makes it easier for water authorities and engineering firms to harness the data in a collaborative manner. It also allows the many volunteers in the landscapes and at Natuurmonumenten who take measurements to access their own data and, if necessary, to make corrections themselves. This way, land managers can obtain a valuable dataset which is also of great value for multiple areas of government.

Past data from Natuurmonumenten and the latest data from Verbelco will be taken from the WaterWeb database and recorded in the Basis Registratie Ondergrond (BRO) in the coming months. This foundational registration programme in the Netherlands is working on a national level with reliable information about Dutch soil.



It is a feather in Klaas Van Der Meulen's cap that WaterWeb has grown to take on such an important position.

The call to reuse

Water authorities are pioneers when it comes to upcycling. When they have surplus, deprecated or defective data loggers, they do not shy away from giving them to Verbelco or another nearby water association. As we have seen with KELLER data loggers, they find a new home being used in monitoring networks for nature management or in other organisations.

"Sustainability is our raison d'etre. Raw materials are becoming more and more scarce and expensive, and we would really welcome a programme to rehabilitate defective data loggers. The fact that we have KELLER data loggers that have been in use for 20 years already goes to show that the lifecycle of high-quality products can seriously outlive expectations."

Klaas Van Der Meulen, Verbelco

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