

Environmental Technology Verification



Statement of Verification

Technology type	Online monitoring systems for storage of liquids	
Application	Monitoring of storage tanks for livestock slurry and digestate	
Technology name	LevelTec	
Company	PlusTec Aps	
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DANETV, The Danish Centre for Verification of Climate and Environmental Technologies, undertakes independent tests of environmental technologies and monitoring equipment.

DANETV is a co-operation between five technological service institutes, DHI, Danish Technological Institute, FORCE Technology, DELTA and AgroTech. DANETV was established with financial support from the Danish Ministry of Science, Technology and Innovation. Further information is available at www.etv-denmark.com.

This verification statement summarizes the results from verification of the LevelTec Online Monitoring System for storage tanks for livestock slurry and digestate from biogas plants.

Description of technology

LevelTec Online Monitoring System includes a pressure sensor, cabling and a control unit with a GSM modem for communication between LevelTec and mobile phones. The pressure sensor and cable are placed in a PVC tube mounted on a galvanised steel frame installed on the inner side of the storage tank wall. The pressure sensor is kept in a fixed position approximately 0.20 meter above the bottom of the slurry tank.

Even small changes in the slurry level are measured by the pressure sensor. A decrease in the slurry level results in a lower pressure and vice versa. LevelTec is programmed so that when a sudden pressure decrease is measured a SMS-message is sent to the owner of the slurry tank or another person responsible for the slurry tank. The purpose of the SMS-message is to make it possible to take immediate actions in case of leakages. Thereby, it is possible to avoid or minimize pollution of nearby streams and lakes.

Environmental Technology Verification

Application of technology

The LevelTec Online Monitoring System is intended for storage tanks for all types of livestock slurry and for digested biomass from biogas plants. Normally, the total solids content of such matrices is within the range of 2.0 – 10.0 %.

The overall purpose of LevelTec is to 1) detect a potential risk for leakage and 2) to report this electronically to the slurry storage tank owner or another person responsible for the tank.

Description of test

The test activities of this verification were divided into two main parts:

- Performance test undertaken by AgroTech and
- Environmental test undertaken by DELTA.

The main purpose of the performance test was to verify that the alarm function of LevelTec Online Monitoring System is functioning as described by the technology supplier; i.e. that the alarm is triggered when it is supposed to be triggered. As part of the performance test LevelTec was tested using pig slurry and cow slurry in a small scale slurry container. The verified technology comprises a complete LevelTec Online Monitoring System including a pressure sensor, cabling and a control unit. In order to undertake the test activities various mobile phones were used for communication with LevelTec Online Monitoring System.

The purpose of the environmental test was to verify the ability of LevelTec to withstand or operate within specified tolerances, while being exposed to the environmental conditions likely to be encountered during normal use.

Verification results

Based on the results of the performance test it is verified that:

- LevelTec is functioning as claimed by PlusTec (technology supplier) and as described in the LevelTec product sheet and LevelTec User Manual.
- LevelTec meets the requirements for slurry storage tank alarms as described by the Danish Environmental Protection Agency in its guideline dated 20.12.2011.

Evaluation of performance test parameters

Parameter	Verified value
Threshold value for reporting leakage measured as decrease in slurry level	0.05 meter
Time from threshold value in slurry level has been reached to SMS message is received by the person responsible for the tank	Maximum 2 minutes*
Warning and alarm messages are received by the tank responsible person in case of slurry tank overflow	Yes – these functions work as claimed.
An alarm is registered and communicated to person responsible for the tank in case of failing power supply	Yes – this function works as claimed.
Alarm is forwarded to a new person in case the communication to the first person did not result in actions that reset the alarm	Yes – this function works as claimed.
The LevelTec system is automatically switched on following a manual switching off (e.g. during emptying of storage tank)	Yes – this function works as claimed.

*Note: Under assumption of satisfactory mobile phone connection coverage.

Environmental Technology Verification

Further information about the methodology and the results of the performance test is included in the LevelTec verification report made by AgroTech for PlusTec Aps.

Based on the results of the environmental test it is verified that LevelTec meets the relevant requirements of the reference standards / reference specifications of the environmental test.

Evaluation of environmental test parameters

Parameter and reference standard /specification	Purpose	Results
Dry heat, operational IEC/EN 60068-2-2:2007	To verify the ability of the test object to operate according to specifications at the upper temperature limit of the use environment.	No malfunction was observed during the exposure. Further, no damages or deteriorations were observed during the visual inspection at standard atmospheric conditions.
Cold, operational including cold start-up IEC/EN 60068-2-1:2007	To verify the ability of the test object to initiate normal operation and operate according to specifications at the lower temperature limit of the use environment.	
Humidity IEC 60068-2-30 (2005)	To verify the ability of the test object to operate under and withstand the deteriorative effects of high temperature/humidity and cold condition.	
Water, operational IEC 60529:2001	To verify the ability of the test object to operate according to specifications when exposed to water in the use environment.	Neither ingress of water nor malfunction was observed after the exposure.
Transient shock, operational IEC/EN 60068-2-57:1999	To verify the ability of the test object to withstand shocks likely to occur during normal use.	No malfunction was observed during the exposure. Further, no damages or deteriorations were observed during the visual inspection performed after the exposure.
Impact (surface point), operational IEC 60068-2-63:1991	To verify the ability of the test object to operate during impacts likely to occur during normal use.	No malfunction was observed during the exposure. Further, no damages or deteriorations were observed during the visual inspection at standard atmospheric conditions, except for cracking of black plastic part.
Cable bending No reference available	To verify the mechanical integrity of cable connections during conditions of cable bending likely to occur during normal use.	No malfunction was observed during the exposure. Further, no damages or deteriorations were observed during the visual inspection at standard atmospheric conditions.
Electrostatic discharge IEC 61000-4-2:2001	To verify that electrostatic discharge occurring on the equipment, or in its vicinity, does not affect its performance or causes malfunction or permanent damage. It is also a test of proper grounding or shielding inside the test object.	No malfunction was observed during the exposure and the function of the test objects was OK after the exposure.
Radiated RF immunity IEC 61000-4-3:2006	To verify the immunity of the test object to fields generated by intentional transmitters (radio, TV, cell etc.).	No malfunction was observed during the exposure and the function of the test objects was OK after the exposure.
Conducted radio frequency IEC 61000-4-6:2007	To verify the immunity of the test object to low frequency fields generated by intentional transmitters (AM radio, TV, cell, etc.). Applicable to AC input and I/O cabling greater than 3	No malfunction was observed during the exposure, and the function of the test objects was OK after the exposure.

Environmental Technology Verification

	m in length.	
Burst/Fast transients IEC 61000-4-4:2004	To verify the immunity of the test object to switching and transient noise. Applicable to AC/DC input and I/O cabling greater than 3 m.	No malfunction was observed during the exposure and the function of the test objects was OK after the exposure.
Surge voltage IEC 61000-4-5:2005	To verify the immunity of the test object to switching and lightning-induced transients. Applicable to AC/DC power inputs, as well as I/O cabling which exceeds 30 m.	No malfunction was observed during the exposure and the function of the test objects was OK after the exposure.
Radiated emission CISPR 16-2-3:2006	To verify that the unintentional E-field emissions from the test object in normal operating mode is below the specified limits.	The radiated emissions were within the specified limits.
Conducted emission CISPR 16-2-1:2008	To verify that the unintentional emissions conducted back on the AC power mains is below the specified limits.	The conducted emissions were within the specified limits.
Power frequency H-field immunity IEC 61000-4-8:2001	To verify the immunity of the test object to low frequency magnetic fields.	No malfunction was observed during the exposure and the function of the test objects as OK after exposure.
Voltage dips and interruptions IEC 61000-4-11:2001	To verify the immunity of the test object to fluctuations on AC power input.	No malfunction was observed during the exposure and the function of the test objects was OK after the exposure.

Full information about the environmental test is included in the DELTA Test Report “Environmental Testing of LevelTec Online Monitoring System” performed for PlusTec ApS.

Quality assurance

The test and verification have been performed according to the AgroTech Test Centre Quality Manual. As a part of the quality assurance an internal and an external technical expert provided review of the planning, conducting and reporting of the verification and tests.

Original signed 17.12.2012		Original signed 17.12.2012	
Signed by Gunnar Hald Mikkelsen Management representative	Date	Signed by Torkild Søndergaard Birkmose Verification responsible, AgroTech	Date

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