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SFT Data Logger to Monitor Combined Sewer Overflows (CSO)

As the water industry's regulatory body, the National Rivers Authority (NRA) is often placed in a position where it is making comments critical of the UK's ten leading sewage companies. However, this doesn't stop them working together in many areas. At the moment, they are actively seeking a solution to the problem of pollution in the UK's rivers. The problem is getting more and more serious as the UK as a nation continues to produce more and more effluent, both at home through the increasing use of white goods such as washing machines and dishwashers, and in industry.

At the moment the situation is far from satisfactory. Under normal conditions sewage moves through the sewerage network ending up at one of the many sewage treatment works. In the event of a storm, the use of combined disposal networks for storm drainage means that there will often be more sewage than the treatment works can accommodate, so that when each centre reaches capacity, the penstocks are closed, causing backing up in the hydraulic network. Each of these systems has at least one combined sewer overflow (CSO) which diverts excess flow to a nearby river or stream.

The first hour or so of these overflow events is often when the most concentrated pollution is spilled over into the river. There is a need to understand more about the behaviour of these structures in order to assess their impact in the receiving water course.

The underlying aim of all this work is to establish consent levels from CSO's. As there are some 23,000 CSO's in the UK, the need to establish precise regulations and solutions becomes clear. Everyone in the water industry is more than keen for these consent levels to be put into place, as at the moment there simply aren't any consistent guidelines. In addition the NRA and water companies want to work toward a system that applies water quality as one of the parameters for consent levels rather than just quantity or frequency.

One of the proposed solutions is to install storage facilities in the sewer system which can hold excess sewage safely until the storm waters subside, allowing the liquor to pass for treatment when the sewage treatment works is once again able to cope, and stopping this highly damaging pollutant from passing into our rivers.

One of the problems to be solved is to monitor accurately the performance of CSO's to see what is being discharged and when, and to measure the effect on river quality. To help with this particular problem, the water companies have established a common interest working group and are working with Water Research centre (WRc) to address the problem. WRc turned to Solutions From Technology (SFT) the Milton Keynes based datalogging and telemetry specialist, to develop a reliable and efficient means of capturing the data which would allow consent levels to be established.

SFT's response is the Combined Sewer Overflow monitor. SFT has over 15 years of technical experience in the manufacture of datalogging equipment for the electricity, gas and water industries, and was thus considered to have sufficient expertise to handle this important project. At the heart of the system is a user-programmable, 12 channel datalogger which can be configured on site, or remotely via the Public System Telephone Network (PSTN). The monitor makes it possible to build a complete picture of how a storm event effects fluid levels in the CSO, and the data it provides helps to reveal the level of sewage being spilled into the river. As well as measuring fluid level, the datalogger also accepts inputs from other devices measuring river water quality indicators, such as dissolved oxygen and pH. In addition, in the event of an overflow, the SFT system triggers an array of samplers located in the spill, and upstream and downstream of the overflow, so that laboratory analysis can take place of the pollutants that have entered the river network.

SFT's CSO monitor is currently still at the developmental stage. It has, however, been in use on a test-site since the beginning of the year, and the results so far look encouraging. To date, the monitor has gathered information on a dozen storm events revealing precisely when the storm began to effect levels in the CSO, right through to the fall-off at the end of the storm. The monitor thus records the duration of the overflow event, the depth of the liquid in the overflow, and its velocity as it passes through. It is therefore possible to calculate how much liquor is spilling into the nearby river and to analyse the samples of the liquor gathered automatically.

The next phase in SFT's programme will be to add a cluster of water quality measuring devices to the system, and record the information they produce. If all continues to go well, the NRA will soon be in a position to begin considering the establishment of consent levels, and the water companies are set to benefit too. The SFT CSO monitors will allow them to determine which sites are the most problematic in terms of the frequency of overflows, and it will help them plan cost-effectively the size of on-site storage facilities needed to hold the excess liquor spilled from each CSO, thus helping to optimise the cost of what is likely to be a considerable investment.

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Paper 4 : SFT Data Logger to monitor CSOs (Michael Merrick, Solutions from Technology Ltd)

Martin Osborne, Hydraulics Research : I note that a float switch had been used to trigger the samplers. As one important aspect was to monitor the movement of pollutants through the system and not just at overflows have other methods of triggering the samplers when there was a rise in water level been investigated.?

Answer : A float switch had been used in the trial as it gave precise control. Other methods such as triggering the samplers when a change in water quality occurred may be possible in future. The controlling software was downloadable, even via a telephone link, so the method of triggering the samplers could easily be changed.

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David Beale, D H V Burrow Crocker : I note that the logger had twelve channels. How often does it need to be debriefed? Cost of the equipment?

Answer : Logger has 256 kBytes of memory as standard, expandable to 0.5 MBytes which is adequate for twelve channels. The memory manager is of the rolling barrel type which overwrites non-important data. The costs had not yet been decided but there was a meeting scheduled for July at which the costs of various options should be fixed.

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Ronald Salinger, Such & Salinger Partners : Why had a float valve had been used to trigger the samplers rather than the ultrasonics?

Answer : For this location it had been easy to set a float switch as the point at which overflow occurred was defined as the top of the weir. There were sedimentation problems at the site which meant that the ultrasonics had to been mounted on the side wall to avoid silting up. He emphasised that the exercise was looking into the practicality of connecting a number of instruments to one controller rather than looking at the actual instruments.

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Brian Sharman, North West Water : I wonder about the logistics of ringing up people to collect samples when the samplers had triggered. What was the time window for collecting them before they deteriorated?

Answer : A meeting with Epic has been arranged to discuss the problem. At the moment if two spill events occur over a weekend samples will only be collected from the first one, the samplers would not try to collect from the second event once they are full. Martin Osborne added that ideally the samples should be taken into refrigerated storage within 6 hours although periods of up to 24 hours had been used in the MOSQITO trials. Comparative tests had been carried out between samples retrieved after 6 hours and those retrieved after 24.

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T Cooper, Northumbrian Water : Can data be interrogated in real time?

Answer : Yes, and the user interface will be expanded in the future. Sampling would be a problem in that there are only a limited number.

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D Walters, M Barber & Co : Are the modems powered by battery? Telemetry uses "line of sight" ; can you not use Cellnet?

Answer : Mains power was available at the test site, but battery powered modems are available. We have used Cellnet.

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