OBJECTIVES

The overall objective of the project is:

"to optimize the global operation of wastewater systems by adequately managing and using all the information available in the plant at every moment".

It is well known that process monitoring systems and automatic controllers play a very important role in wastewater treatment plants (WWTPs). On the one hand, process monitoring software tools are in general meant to facilitate the daily decision making of the WWTP operators, where the information needed by these monitoring systems mostly comes from heterogeneous data sets made up by various sources of data in the plant (online sensors and analysers, laboratory analysis, programmable logic controllers, etc.). On the other hand, process controllers become a must when complex decisions must be based on a large number of operational variables in order to maintain the optimum operational point of a plant.

However, the successful implementation of existing process monitoring software tools and control systems very much depends on the reliability and completeness of the data collected, the quality of the information extracted and how quickly and easily it is accessed. On the one hand, although online sensors and analysers as well as data acquisition and data base systems have greatly evolved, they do not guarantee reliable data, high quality information and easy access: sensors have failures, delays, drift and noise, and data acquisition and data base systems frequently are incompatible.

On the other hand, not all the data are measured online; that is, some of the data used to analyse the behaviour of a WWTP can only be obtained in the laboratory. This is the case, for example, with some crucial parameters such as COD, biodegradable COD, nitrogen, or phosphorous: due to the lack of appropriate online sensors for measuring these parameters, there is no other solution than analysing them in the laboratory. This obliges WWTPs to use sparse and delayed laboratory results (some laboratory experimental data might not be available for days or weeks).

These limitations greatly complicate proficient process online monitoring and control, and thus optimally operating the plant is complicated; that is, the plant might continue working at a conservative, standard operational point but without exploiting all of its potential in terms of effluent quality, process robustness and operational costs. In fact, many automatic control strategies that have shown their usefulness at simulation scale, or even pilot plant scale, are experiencing a limited full-scale plant applicability because they are particularly sensitive to the quality of the experimental data needed (errors, failures, noise, delays, loss of data, etc.), which means they should incorporate data pretreatment algorithms that are capable of analysing the measures before sending them back to the controller (Maiza *et al*., 2011). In other cases, especially for supervisory control loops, optimum utilization of the controllers requires information from different elements of the system and not only from those local elements on which they are directly acting; for example, controlling a sludge line of a given WWTP by taking into account the status of the

water line, and vice versa, will be much more efficient and optimum than designing a controller using only local information (sludge line-related or water line related, but not both), which requires advanced controllers to have common access to reliable and complete data not only regarding the status of the system/process that they are acting on but also regarding the status of adjacent and interrelated systems/processes.

In this respect, DIAMOND addresses the development of a software platform (the ADAM Tool) in order to overcome all these drawbacks and limitations providing duly processed, condensed and enriched, reliable and high quality plant data of interest, as well as straight forward and immediate access to valuable supplementary information about the status of other elements of the WWTP. The ADAM Tool, together with all of its auxiliary algorithms and tools, will facilitate the successful implementation of process monitoring and automatic control systems for existing and future wastewater treatment systems, thus allowing the main objective of this project to be met, which is optimising the global operation of WWTPs.

References

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