

Bridge over troubled water sources

Through new but practical, case-specific methods and technologies, **Willy van Tongeren** and partners of the AquaFit4Use consortium believe Europe is more than capable of leading the way in promoting more efficient and sustainable water use across its industrial sectors



With contributions from Angeles Blanco, Marielle Coste, Rainer Eichhorn, Lucija Kobal and Martin Krecic

To begin, could you explain what the main aims of the project are?

With AquaFit4Use we want to make real steps forward in sustainable water use in industry, not only through the development of new reliable and cost-effective technologies and tools but also by pilots in practice, to propose on-site validated solutions for industry.

Could you describe the different approaches for paper, chemical, food, and textile industries?

The general approach is the same; define what water quality you need, look at the available water sources and decide on the technologies to produce water and control of the required quality. However, the obstacles faced are different: for food production, health aspects play a more than moderate role; in paper, we talk about 'stickies' influencing papermaking, as well as accumulation of salts, like calcium (precipitation) and chloride (corrosion);

for textiles, colour and surfactants are very important.

The chemical industry is very diverse, so every product has its own demands. Also, the volumes differ between sectors and according to the size of the factory. The paper sector already has a high degree of water circuit closure, but still uses a lot of water; further closure requires a combination of advanced and expensive technologies. As one partner points out, their feedback in terms of experiments in water closure cycle is very important for other industrial sectors such as scaling, biofilm management and more.

What benefits will AquaFit4Use gain through this cross-sectoral approach?

We hope that the sectors really learn from each other. They have a number of common issues, but sectors also have specific expertise on others topics: food industries have more basic knowledge about the health and safety aspects in relation to the product quality; textiles have more colour removal knowledge; and paper more awareness of big volumes, particle removal and closure of circuits. Aside from SMEs, this is an excellent opportunity to make use of the existing and newly developed knowledge in big companies.

To what extent could this research impact the cost of providing a sustainable water supply?

As water itself is relatively cheap this not the main driver. But when you look at all the water related costs (energy content, discharge and treatment costs and content of re-usable raw materials) there is a real economic driver, that will be enlarged by increasing scarcity. This project increased the insight into these costs and came up with a number of interesting technologies to make sustainable water use possible, as well showing that these technologies are really applicable in practice.

On the other hand, advanced treatments are necessary to achieve a high water quality and interesting technologies have been developed, for example Denutritor, Capacitive Deionization and Multiflo softening and VIT-kits for fast monitoring of microorganism. Additionally we have a number of onsite validated technologies and treatment lines.

We have also compared the costs of reclaiming municipal waste water or mill effluents and we have shown that each case is different and that we need to develop tailor made solutions adapted to the specific water stress of each company.

Securing sufficient quantities of water of good quality for urban, industrial and agricultural use is a major driving force behind the current EC policy. Are you hoping to have an impact and could this project further serve to develop and adapt policy?

This was more or less the starting point for the project and will certainly have an impact in this regard. It even resulted in the choice by a paper mill in Spain to completely change their water source to municipal reclaimed water. In this case, due to the current high closure of the water circuits and health issues, the quality demands are very high and the effluent of the urban Wastewater Treatment Plant must be regenerated by a double membrane treatment and a disinfection process. In this case, monitoring and control of the water quality is a key issue for the safe use of reclaimed water.

Further to this, we have collaborated with the European Water Partnership in the development and validation of a new tool to assess a sustainable water used in industry. The pilot studies carried out have allowed improving the tool that will be used by industry, on a voluntary basis, to assess and certify their sustainable water use that will help to adapt the European Water Directive.

Quantifying water quality and resource efficiency

Ensuring water is used efficiently and effectively is an increasingly pressing concern in the face of water scarcity problems. The **AquaFit4Use** project is seeking tailored knowledge and custom technologies which could help water-intensive industries in Europe save money – and mitigate water stress and environmental impact

ON OUR INCREASINGLY resource-constrained planet, one thing can always be considered a top priority: water. As industry, agriculture, household and other uses compete for water, it is becoming one of the most serious societal and economic challenges humankind faces. The time has surely come to pay water uses proper attention, given their enormous potential impacts. The AquaFit4Use project emerged from the Water and Industry Group of the European Technology Platform for Water (WssTP), which set out a long-term vision for research priorities in the water sector. The project is regarded by the EC as a flagship project in this area.

As the project's coordinator Willy van Tongeren outlines, the industry partners involved have been keen to highlight water's pivotal role for their future: "The industrial sectors expressed their awareness of water's importance in their processes, the need to have the right quality always available and that water is not a consumable, but a highly valuable asset". Pressurised competition between drinking water and agriculture means industry has to come up with fresh solutions and approaches, through re-use and application of water fit for purpose – and it is here that AquaFit4Use is making real headway.

KEY QUESTIONS

Industry consumes several billions of cubic metres of water a year and, in doing so, is a



FACT PILOT FOR HARDNESS REMOVAL

We need strategies and technologies to achieve and maintain required water qualities for efficient use of water resources

major factor in the amount of clean water available. They would benefit hugely from having available water qualities which meet their specifications, and is carefully tailored to suit product demand. To begin to be able to meet this demand, there are key questions to be answered, regarding appropriate water qualities for various processes in target industries, how these can be produced, maintained, monitored and controlled, and finally the effects of using different water qualities.

OVERCOMING A LACK OF AWARENESS

One of the best means of decreasing the reliance of industry on fresh, high-quality water is closing the water cycle – using other water sources or waste water, depending on requirements. But to do so, you must define that need. As van Tongeren points out, this lack of awareness in industry represents a huge missed opportunity for water conservation: "Nowadays, it is common that the quality of water used is unnecessarily high – often drinking water – to be on the safe side: this is not needed, but most industries do not really know what the real demands for their processes are," he asserts.

So far, van Tongeren's team has discovered a huge diversity of need and that, in some cases, a consistent rather than specific water quality is the crucial factor. Rainer von Eichorn of paper manufacturers Hamburger Rieger confirms the need for ongoing research and tests after instances where their attempts to close the water cycle for production have failed: "In this high-consumption process, the provision of high-quality water for the paper machines – a major outlay in the overall cost – can be make-or-break for the equipment's long-term functionality".

COST-EFFECTIVE SOLUTIONS

Gaining such a control over differentiated water qualities, tailored to specific industries' needs, will need reliable and cost-effective methods to provide solutions. This must mean a comprehensive mixture of technologies, methods and tools – to define, produce and control water which is fit for use, to close the water supply and apply new sources, and to reduce the water



footprint of different industries all of which will require laboratory research and pilot schemes in industry and in practice. The project's endeavour is to reduce fresh water needs by 30 per cent and lessen energy, emission and sludge impacts on the environment, through increased productivity, safety and health of water 'fit-for-use'.

Van Tongeren believes that the strong involvement of water industrial users could lead to the use of alternative resources which realise their potential applications: "Alternative water sources are becoming available, such as municipal reclaimed water, but industries are not aware of its potential uses. Integrated and cross-sectoral solutions are necessary to achieve a sustainable water use in industry". These solutions are surfacing in AquaFit4Use, in the form of modelling and monitoring tools, but the emphasis is at the development of new treatment technologies and technology trains of new and existing techniques.

STRONG APPLICABILITY

The project's consortium features 34 partners and over 100 participating individuals, with an impressive 65 per cent industrial participation. While their involvement is key, a paradigm shift in the way the public views water consumption could also be vital, as van Tongeren elaborates: "We need strategies and technologies to achieve and maintain required water qualities on one hand, but on the other, the technological solutions must be accepted by both industry and the general public".

Its strong industrial representation and their vested interest in the consuming public is what van Tongeren believes sets this work apart: "The project is unique in its applied approach, which starts with the team's composition: two-thirds of the partners are from industry – industrial suppliers and end-users. The success of the project is determined not only by the scientific level of the results, but by their applicability: the application of technologies, existing and emerging, to come to real innovation," he states. Marielle Coste of Veolia Water builds upon the



point that industries must have certainty if they are to implement significant change: "It's clear that for industry, recycling waste water in their core activity (their production) can be considered as risky due to the potential direct impact on the quality of their final product (eg. colour in paper or in textiles). They have to be confident in the treatment processes to be implemented and in the quality control of the recycled water."

With industrial partners able to identify their own needs – to appropriate tested technologies in pilot industrial sites – as well as to implement the developed solutions, the project has enabled a strong move towards sustainable water use in industry. Lucija Kobal and Martin Krecic of the Slovenian Textile company Tekstina confirm the importance of the applied research for SMEs: "Pilot testing at location shows the real opportunities of the developed solutions".

RESEARCH INTO PRODUCTION

Culminating with the end-congress on 8-9 May 2012 in Bruges, the project has already reached some valuable initial conclusions. While it may be tempting to draw broad assumptions on water use, in fact a local situation can define the possibilities and restrictions for sustainable use. Insight into individual water systems has been proven as a key motivator to good management – and that to reach this insight, tools must be practical and user friendly. Van Tongeren is excited about the potential of some technologies developed through their work, such as Capacitive Deionization Denutritor, and also about combinations of existing technologies: "We still have one year to go where a number of pilot tests with different treatment trains will be carried out. During the project a lot of attention is and will be paid to dissemination and exploitation – detailed plans will be written for all new technologies," he expounds.

Having shown that water cost is not the only main driver in industrial water use, but that combinations of legislation, availability, energy and raw material availability all comprise a web of causality, the case for an integrated approach has never been more forcefully put. While there are some positive examples of direct application of project results, in others the availability of capital is a barrier. However, with some project partners using AquaFit4Use's results to demonstrate the economic incentives sustainable practices can offer, the project's longevity and reach may only just have begun.

INTELLIGENCE

AQUAFIT4USE

WATER IN INDUSTRY – FIT-FOR-USE
SUSTAINABLE WATER USE IN CHEMICAL,
PAPER, TEXTILE AND FOOD INDUSTRY

OBJECTIVES

To develop reliable cost-effective technologies and tools to make industries more independent of the supply of fresh drinking water for their production processes by obtaining water qualities that are tailored to suit product and process demands and quality standards: in other words, 'water fit-for-use'.

PARTNERS

TNO, The Netherlands (coordinator) • Alpro, Belgium • Atmsa, Spain • Aquatest, Czech Republic • BASF, Belgium • CEIT, Spain • DHI, Denmark • Deltaris, The Netherlands • ENEA, Italy • EUCETSA, Belgium • EnviroChemie, Belgium • GVTarra Cons. Hijos de M Sanchez Besarte, Spain • Hamburger Rieger, Germany • HOLMEN, Spain • INOTEX, Czech Republic • Irspin, Slovenia • Logisticon, The Netherlands • Nestlé Water, France • OBEM S.p.A., Italy • PCCell GmbH, Germany • Perstorp, Sweden • Papiertechnische Stiftung, Germany • SAPPI, The Netherlands • Svilanit, Slovenia • Tekstina, Slovenia • Complutense University of Madrid, Spain • Unilever, The Netherlands • University of Maribor, Slovenia • Uniresearch, The Netherlands • Veolia, France • Vermicon, Germany • Vito, Belgium • Wedeco, Germany

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CAPDI PILOT

